UNIVERSITY OF ENGINEERING & MANAGEMENT,JAIPUR

Lecture-wise Plan

Subject Name: English Language & Technical Communication-I **Subject Code-HU101**
Year: 1st Year **Semester: First**

Module Number	Topics	Number of Lectures
1	**ENGLISH LANGUAGE GRAMMAR**	**10L**
	1. Correction of Errors in Sentences Building Vocabulary Word formation Single Structures and Transformation	3
	2. Word for a group of Words Fill in the blanks using correct Words Sentence	3
	3. Active &Passive Voice Direct &Indirect Narration (MCQ Practice during classes).	4
2	**READING COMPREHENSION**	**3L**
	1. Strategies for Reading Comprehension Practicing	1
	2. Technical & Non Technical Texts for Global/Local/Inferential/Referential comprehension; Précis Writing	2
3.	**TECHNICAL COMMUNICATION**	**8L**
	1. The Theory of Communication– Definition & Scope Barriers of Communication	4
	2. Different Communication Models Effective Communication (Verbal/Nonverbal) Presentation/Public Speaking Skills (MCQ Practice during classes)	4
4	**MASTERING TECHNICAL COMMUNICATION**	**6L**
	1. Technical Report (formal drafting) Business Letter (formal drafting)	3
	2. Job Application (formal drafting) Organizational Communication (seepage3)	3
5	**GROUP DISCUSSION**	**4L**
	1. Principle & Practice	4
Total Number Of Hours = 31		

Faculty In-Charge HOD, HU Dept.

UNIVERSITY OF ENGINEERING AND MANAGEMENT, JAIPUR

Lecture-wise Plan

Assignment:

Unit-1(ENGLISH LANGUAGE GRAMMAR):

1. Exercise of Active &Passive Voice Direct &Indirect Narration (MCQ Practice during classes).

Unit-2 (READING COMPREHENSION):

1. Précis Writing.

Unit-4(TECHNICAL COMMUNICATION):

1. Job Application practice

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Lecture-wise Plan

Subject Name: Physics-1 **Subject Code-PH101**
Year: 1st Year **Semester: First**

MODULE NO.	COURSE DETAILS	Total Lectures
1	**Module 1: Oscillation:** 1.1 Simple harmonic motion: Preliminary concepts, Superposition of S. H. M's in two mutually perpendicular directions: Lissajous figures 1.2 Damped vibration: Differential equation and its solution, Logarithmic decrement, Quality factor. 1.3 Forced vibration: Differential equation and its solution, Amplitude and Velocity resonance, Sharpness of resonance. Application in L-C-R Circuit	**6**
	Numerical and Problem solving	**2**
2	**Module 2: Optics 1:** 2.1 Interference of electromagnetic waves: Conditions for sustained interference, double slit as an example. Qualitative idea of Spatial and Temporal Coherence, Conservation of energy and intensity distribution, Newton's ring 2.2 Diffraction of light: Fresnel and Fraunhofer class. Fraunhofer diffraction for single slit and double slits. Intensity distribution of N-slits and plane transmission grating (No deduction of the intensity distributions for N-slits is necessary), Missing orders. Rayleigh criterion, Resolving power of grating and microscope. (Definition and formulae)	**8**
	Numerical and Problem solving	**2**
3	**Module 3: Optics 2:** 3.1 Polarization: General concept of Polarization, Plane of vibration and plane of polarization, Qualitative discussion on Plane, Circularly and Elliptically polarized light, Polarization through reflection and Brewster's law, Double refraction (birefringence) - Ordinary and Extra-ordinary rays . Nicol''s's Prism, Polaroid. Half wave plate and Quarter wave plate 3.2 Laser: Spontaneous and Stimulated emission of radiation, Population inversion, Einstein's A & B co- e ficient (derivation of the mutual relation), Optical resonator and Condition necessary for active Laser action, Ruby Laser, He-Ne Laser- applications of laser. 3.3 Holography: Theory of holography, viewing the hologram, Applications	**6**
	Numerical and Problem solving	**2**
4	**Module 4: Quantum physics:** 4.1 Concept of dependence of mass with velocity, mass energy equivalence, energy-momentum relation (no deduction required). Blackbody radiation: Rayleigh Jeans' law (derivation without the calculation of number of states), Ultraviolet catastrophe, Wien's law, Planck's radiation law (Calculation of the average energy of the oscillator), Derivation of Wien's displacement law and Stephan's law from Planck's radiation law. Rayleigh Jean's law and Wien's law as limiting case of Planck's law. Compton Effect (calculation of Compton wavelength is required). 4.2 Wave-particle duality and de Broglie's hypothesis, Concept of matter waves, Davisson-Germer experiment, Concept of wave packets and Heisenberg's uncertainty principle.	**6**
	Numerical and Problem solving	**2**
5	**Module 5: Crystallography:** 5.1 Elementary ideas of crystal structure : lattice 5 , basis, unit cell, Fundamental types of lattices – Bravais lattice, Simple cubic, f.c.c. and b.c.c. lattices, (use of models in the class	**4**

	during teaching is desirable] Miller indices and miller planes, Co-ordination number and Atomic packing factor. 5.2 X-rays : Origin of Characteristic and Continuous X-ray, Bra g's law (No derivation), Determination of lattice constant.	
	Numerical and Problem solving	**2**
Total Lectures Required		**40**

ASSIGNMENT:

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Assignment No.-1

Module 1-oscillation Part – Simple Harmonic Motion

THEORY

1	a. Derive the expression for velocity and acceleration of a particle executing SHM. Hence show that the position where velocity is maximum acceleration is minimum and vice-versa. b. Show that the mean (average) kinetic and potential energies of non-dispersive simple harmonic vibrating systems are equal. c. Plot the energy distribution curve.
2	a. A bob of mass '*m*' is hanging vertically with the help of a weightless, inextensible and flexible string from a rigid support. It is given a small angular displacement ' ϕ '. Derive the expression of the time period and frequency of oscillation and hence show that the displacement and velocity graph of the oscillator is elliptical. b. A spring is hung vertically and loaded with a mass 'm'. When it is at equilibrium, it is given a small oscillation and released. Calculate the time period and frequency of oscillation. If the spring constant be increased, will there be any change in the frequency of oscillation? c. A cubical block of side '*l*' and density is floating in a liquid of density ρ ($\rho > \sigma$). The block is slightly depressed and released. Show that it will execute Simple Harmonic Motion. Determine the time period and frequency of oscillation. d. A liquid of density ρ is poured in the U-tube of cross-sectional area '*A*'. At equilibrium the height of the liquid column is '*l*'. If pressure is applied on the liquid column in one arm of the tube and then released, then show that the liquid column will begin to oscillate. Also calculate the time period and frequency of oscillation.
3	a. State the superposition principle of SHM. b. Show that the resultant of two mutually perpendicular SHM having same period but different amplitudes and phases, gives an elliptical motion. Under what conditions will the path of the resultant motion be a circle and a straight line?

	c. Two SHM having equal period but different amplitude and phase propagating in the same direction. Find the value of their resultant amplitude and phase. d. What are Lissajous figures? Write the uses of these figures.

NUMERICALS

4	A SHM is given by the equation x= 3 sin ωt + 4 cos ωt. What is its amplitude?
5	A particle performs simple harmonic motion given by the equation y= 20 sin (ωt + α). If the time period is 30 seconds and the particle has a displacement of 10 cm at t=0, find (i) epoch (ii) the phase angle at t=5 second (iii) the phase difference between two positions of the each particle 15 seconds apart.
6	A particle executes SHM given by the equation $y = 12\sin(\frac{2\pi}{10}t + \frac{\pi}{4})$ meter. Calculate (i) amplitude (ii) frequency (iii) epoch (iv) displacement, velocity and acceleration at $t = 1.5$s (v) maximum displacement, velocity and acceleration.
7	Write down the equation of a wave travelling along negative x-direction. And having an amplitude 0.01 m, frequency 550 Hz and speed 330 m/s.
8	A point is executing SHM with period π seconds. When it is passing through the centre of its path, its velocity is 0.1 m/s. What is its velocity when it is at a distance of 0.03 m from mean position?
9	The motion of a particle in SHM is g[illegible] by *x= a sin ωt*. If it has a speed *u* when displacement is x_1 [illegible]d speed is *v* when the displacement is x_2, show that the amplitude of motion is $a = \sqrt{\frac{v^2x_1^2 - u^2x_2^2}{v^2 - u^2}}$
10	A uniform spring of force constant *k* is cut into two pieces of equal length. What is the force constant of each piece?
11	A uniform spring of force constant *k* is cut into two pieces having length ratio of 1:3. What is the force constant of each piece?
12	A small body of mass 0.12 kg is undergoing SHM of amplitude 8.5cm and period 0.2s. What is maximum force? If the motion is due to spring, what is the value of *K*?
13	Sow that for a body executing SHM, the acceleration leads the velocity by $\frac{\pi}{2}$ and displacement by π.
14	A particle executing SHM is at its mean position at t=0. At time t=0.1s and t=0.2s, the displacements are 1cm and 1.5cm respectively. Determine the frequency and amplitude of vibration of the particle.
15	What is the displacement of a particle in SHM from its equilibrium position when its (i) KE is one-half of its maximum KE? (ii) KE and potential energy are equal?
16	When a particle executing SHM is 2 cm away from the mean position, its kinetic energy (KE) is double the potential energy (PE). At what distance from the mean position will the PE be double the KE?

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ASSIGNMENTS ON DAMPED VIBRATION

Module -1: Damped Vibration

Theoritical Questions:

1	a. Define free vibration and damped vibration. b. Write down the differential equations for damped harmonic motion with proper explanation of all terms. c. Solve the differential equation to find the instantaneous displacement of a damped oscillator. d. Discuss the conditions under which the oscillations are over damped, under damped and critical damped? e. Give a graphical comparison among the following: (i) simple harmonic motion (ii) over-damped harmonic motion (iii) under-damped harmonic motion and (iv) critically harmonic motion.
2	d. What is the effect of damping force? e. Prove that for under damped motion the amplitude of vibration decreases exponentially with time. f. Show that the ratio of successive amplitudes of under-damped motion is constant. g. What do you understand by *logarithm decrement*, *relaxation time* and *quality factor* of a weakly damped oscillator? What are the relationships between them? h. Show that the amplitude of a weekly damped oscillator reduces to half of its initial value in time $t = \tau \ln 2$, where τ is the relaxation. i. In under damped motion, show that power dissipation is directly proportional to the damping constant.

Numericals:

1	In a second pendulum, the amplitude falls to half of its value in 150 seconds. Calculate the Q factor.
2	The frequency of a tuning fork is 250 Hz and its quality factor is 4×10^4. Find the time taken to reduce its energy to $1/8$ th of its initial value.
3	The amplitude of an oscillator falls to $1/10$th of its initial value after completing 2000 cycles. The frequency of the oscillator is 200 cycles per second. Calculate (i) damping constant (ii) relaxation time (iii) quality factor (iv) time required to fall its energy by to $1/10$th of its initial value.
4	A massless spring of spring constant 10N/m is suspended from a rigid support and carries a mass of 0.1kg at its lower end. The system is subjected to a resistive force $-\beta\upsilon$. It is observed that the system performs damped oscillatory motion and its energy falls to $1/e$ times of its initial value in 50s. (i) What is the value of damping constant? (ii) What is the value of Q-factor?
5	Show that in case of damped oscillation with a small amount of damping, the corresponding time

	period of oscillation is higher than the time period of free oscillation.

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ASSIGNMENTS ON FORCED VIBRATION

Module -1: Forced Vibration

Theoritical Questions:

f. What is forced vibration? Write down the differential equation of a damped oscillator subjected to a periodic force of constant amplitude and frequency
g. What do you mean by *transient state* and *steady state* of forced vibration. Discuss the factors characterizing them.
h. In steady state forced vibrations derive the expression for the amplitude and phase of driven oscillator.
i. Starting from the solution of the equation for forced vibration, explain the phenomena of amplitude and velocity resonance deriving the value of the driving frequency in each case.
j. Show that the maximum amplitude depends upon the damping factor.
k. Show that at velocity resonance the maximum velocity is inversely proportional to damping constant.
l. Discuss amplitude and velocity resonance. Distinguish between amplitude and velocity resonance.
m. Draw the variation of amplitude and velocity amplitude with applied frequency.
n. Derive an expression for the average power supplied by the sinusoidal force driving a mechanical oscillator over a complete cycle in the steady state.
o. Show that in steady state the time-averaged input power supplied by the forcing system equals the rate of work done by the forced system.
p. A series L-C-R circuit is subjected to a sinusoidal emf $V=V0 \cos \omega t$. Find electrical impedance of this system and compare it with any mechanical impedance.

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ASSIGNMENTS ON INTERFERENCE

Module -2: Interference

Theoritical Questions:

1	q. Explain Huygens' principle of wave front. r. What do you mean by wave front. s. What is the phase difference between any two points of a wave front? t. What is the relation between (i) phase difference and path difference (ii) geometrical path and optical

	path.
2	j. What is interference of light? k. Discuss the basic conditions of obtaining sustained interference patterns.. l. What will be the effect on the interference pattern if the phase difference between the two interfering waves changes continuously? m. Can we produce interference with two electric bulbs placed side by side? n. Define coherent sources. Name the methods of obtaining coherent sources and give examples. o. What do you mean by spatial and temporal coherence? p. What do you mean by constructive and destructive interference? What is the phase difference and path difference between two waves to get constructive and destructive interference? q. How can the coherent sources be achieved by a single source?
3	a. Deduce an expression for the intensity at a point in the region of superposition of two waves of same period. b. Show that the formation of interference fringes is in accordance with the law of conservation of energy. c. Monochromatic light from a narrow slit falls on two parallel slits and the interference fringes are obtained on a screen. Calculate the spacing between two consecutive bright or dark fringes. d. Show that in Young's double slit experiment fringes are of equal width. e. In Young's double slit experiment , if white light is used instead of monochromatic light, what changes are observed in interference pattern? f. What is the effect of fringe width in Young's double slit experiment if ----- (i) The separation between the slits is increased. (ii) The point source is moved closer to the double slit. (iii) Screen is moved away from the plane of the slits. (iv) Light of smaller visible wavelength is used. g. If the phase difference between light waves emerging from the two slits of Young's experiment is π, will there be bright fringe at the conventional position of central fringe.
4	Discuss the phase change due to reflection of light from the surface of a denser medium.
5	a. Discuss the phenomenon of interference of light due to thin films and find the condition of maxima and minima b. Show that the interference patterns of reflected and transmitted light are complementary. c. When a thin film of oil on water surface is exposed to sunlight, brilliant colors are seen in the film. Explain. d. Why an 'excessively' thin film seen in reflected light appears perfectly black?

Numericals:

1	If in an interference pattern, the ratio between maximum and minimum intensities is 36:1, find the ratio between the amplitude and intensities of the two interfering beams.
2	Two coherent sources whose intensity ratio is 81:1 produce interference fringes. Deduce the ratio

	of maximum intensity to minimum intensity in the fringe system.
3	Two sources of intensities I and 4I are used in an interference experiment. Obtain intensities at points where the waves from two sources superimpose with a phase difference of (i) 0 (ii) $\pi/2$ (iii) π
4	Two coherent sources of intensity ratio α interfere. Show that in the interference pattern $\frac{I_{max}-I_{min}}{I_{max}+I_{min}}=\frac{2\sqrt{\alpha}}{1+\alpha}$
5	In a Young's double slit experiment, two narrow slits, 0.8 mm apart, are illuminated by the same source of yellow light (589.3 nm). What is the distance between two successive bright bands in the interference pattern observed on a screen 2m away?
6	In a Young's double slit experiment, the angular width of a fringe formed on a distant screen is 0.1°. The wavelength of light used is 650 nm. What is the spacing between the slits?
7	In a Young's double slit experiment with monochromatic light, the fringes are observed on a screen placed at some distance from the slits. If the screen is moved by $5x10^{-2}$ m, the change in fringe width is $3x10^{-5}$m. If the distance between the slits is 10^{-3} m, calculate the wavelength of the light used.
7	In a particular two-slit interference pattern with λ = 600 nm, the zero order and 10th order maxima fall at micrometer readings 12.34 mm and 14.73 mm. If λ is changed to 500 nm, deduce the position of zero order and 20th order fringes, the other arrangements remaining the same.
8	A beam of light consisting of two wavelengths 650 nm and 520 nm is used to obtain interference fringes in Young's double slit experiment. The distance etween the slits is 2 mm and distance between the slits and the screen is 120 cm. (i) Find the distance of the third bright fringe from the central maximum for the wavelength 650 nm. (ii) What is the least distance from the central maximum where the right fringe due to both the wavelength, coincide?
9	In a double slit interference pattern at a point, we observe the 8th right fringe for 770 nm. What order would be visible at the same point, if the source is replaced by light of wavelength 473.8 nm.
10	In a Young's double slit experiment, the distance between the slits is 1 mm and the distance of the screen from the slits is 1 m. If light of wavelength 6000 A° is used, then find the distance between second dark fring and the fourth bright fringe.
11	In a Young's double slit experiment, the slits are 0.5 mm apart and interference is observed on a screen placed at a distance of 100 cm from the slits. It is found that the 9th bright fringe is at a distance of 8.835 mm from the 2nd dark fringe from the centre pattern. Find the wavelength of light used.
12	When two narrow slits separated by a small distance are illuminated by alight of wavelength 5 x 10^{-7} m, interference fringes of width 0.5 mm are found on a screen. What should be the wavelength of light source to obtain fringes of width 03 mm, if the distance between the screen and the slit is reduced to half of its initial value?
13	Light of wavelength 5100 A° from a narrow slit is incident on a double slit. If the overall separation of 10 fringes on a screen 200 cm away is 2 cm, find the double slit separation.

14	A parallel beam of sodium light with a wavelength of 5880 A° is incident on a thin glass plate of refractive index 1.5 such that the angle of refraction in the plate is 60°. Calculate the smallest thickness of the plate which will make it appear dark by reflection
15	White light is passed through a double slit and interference pattern is observed on a screen 2.5 m away. The 1st violet and red fringes are formed 2 mm and 3.5 mm away from the central white fringe. Calculate the wavelength of violet and red light.
16	White light is used in Young's double slit experiment. Find the minimum order of violet fringe (λ= 400 nm) which overlaps with a red fringe (λ= 700 nm).
17	A thin soap film (μ=1.33) seen by sodium light (λ=5893 A°) by normal reflection appears dark. Find the minimum thickness of the film.
18	A parallel beam of light of wavelength 5890 A° is incident on a thin glass plate (μ=1.5) plate such that the angle of refraction into the plate is 60°. Calculate the smallest thickness of the plate which will make it appear dark by reflection.
19	Calculate the minimum thickness of the thin film (μ=1.4) in which interference of violet component (λ=4000 A°) of incident light can take place by reflection.
20	An oil film (μ=1.47, t=0.12 μm) rests on a pool of water. If light strikes the film at an angle of 60°, what is the wavelength reflected in the first order?

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ASSIGNMENTS ON DIFFRACTION

Module -2: Diffraction

Theoritical Questions:

1. Derive the expression of intensity at a point for Fraunhofer diffraction due to single slit. Draw the intensity distribution curve and explain it. Find conditions for maxima and minima using it.
2. Discuss double slit diffraction and hence find conditions for maxima and minima. Also find condition and position for missing orders.
3. What is a grating? Find distribution of intensity for a plane diffraction grating of n slits.
4. Find the missing orders for a double slit Fraunhofer pattern if the width of each slit if 0.15 mm and they are separated by a distance of 0.60 mm.
5. In double Fraunhofer diffraction, calculate the fringe spacing on a screen 50 cm away from the slits, if they are illuminated with blue light (wavelength = 4800Å). Here slit separation b=0.1 mm and slit width a=0.02 mm. What is the linear distance from the central maximum to the first minimum of the fringe envelope?

6. Monochromatic light of wavelength 6000Å incidents normally on a plane transmission grating of 2 cm width. The second order spectrum is formed at an diffraction angle 30^0. Calculate the total number of lines in the grating.
7. How many orders of spectrum is visible with sodium light of wavelength 5000Å by means of a plane transmission grating with 2900 lines per inch?

Numerical Questions:

1. A diffraction grating used at normal incidence gives a line (5400 A°) in a certain order superposed on the violet line (4050 A°) of the next higher order. How many lines per cm are there in the grating if the angle of diffraction is 30°?
2. A slit is placed in front of a lens of focal length 0.5 m and is illuminated normally with light of wavelength 5.89×10^{-7} m. The first diffraction minima on either side of the central diffraction maxima are separated by 2×10^{-3} m. Find the width of the slit.
3. In grating spectrum, which spectral line in 4^{th} order will overlap with the 3^{rd} order line of 5461 A°.
4. A plane transmission grating produces an angular separation of 0.01 radian between two wavelengths observed at an angle of 30°. Given mean value of wavelength is 5000 A°. Calculate the difference in two wavelengths if the spectrum is observed in the second order.
5. Consider Fraunhofer diffraction at single slit. Calculate the wave length of light whose first diffraction maximum is produced at an angle θ from the axis using a single slit and it coincides with the first minimum for red light of 650 nm.
6. Parallel light consisting of two monochromatic radiations of λ_1 = 6000 A° and λ_2 = 4000 A° falls normally on a plane transmission grating ruled with 5000 lines per cm. What is the angular separation of the second order spectra of the two wavelengths?
7. Show that the relative intensities of successive maxima in Fraunhofer diffraction at single slit are nearly 1:0.045:0.016:0.008.
8. Crystals are suitable for study of diffraction of X-ray. Why?

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ASSIGNMENTS ON POLARIZATION

Module -3: Polarization

Theoritical Questions:

1	u. What is polarization of light? v. Distinguished polarized light from unpolarized light. w. Define plane of vibration and plane of polarizaton. x. Explain-Polarization is the property of transverse wave. y. How to represent unpolarized light and unpolarized light. z. What are the ways to produce polarized light.
2	r. What is Brewster's law? Show that when a ray is incident at Brewster's angle the reflected ray is perpendicular to the refracted ray s. Explain how to get polarized light by reflection and refraction.

	t. State and explain Malus law. u. Explain the process of getting polarized light using calcite as an example of doubly refracting crystal. v. What do you mean by double refraction? Give two examples of doubly refracting crystal. w. Explain: (i) isotropic and anisotropic medium (ii) uniaxial and biaxial crystal (iii) positive and negative crystal.
3	a. Discuss the principle of Nicol Prism. b. Explain how Nicol prism can act as polarizer and analyzer. c. What do you mean by (i) retardation plate (ii) λ/4-plate or quarter wave plate (iii) λ/2-plate or half wave plate? d. What is meant by plane polarized, circularly polarized and elliptically polarized light? e. Show that plane polarized and circularly polarized are special case of elliptically polarized light. f. Explain how you can produce circularly and elliptically polarized light. g. Describe how with the help of a Nicol prism and a quarter wave plate, plane polarized light, circularly polarized light, elliptically polarized light and partially polarized light are detected? h. How you will distinguish between (i) unpolarized light and partially polarized light (ii) circularly polarized light and unpolarized light (iii) elliptically polarized light and partially polarized light? i. What are polaroids? Mention their uses.

<u>Numericals:</u>

1	The refractive index for water is 1.33. Calculate the polarising angle for water.
2	The refractive indices of glass and water are 1.54 and 1.33 respectively. Which will be greater-the polarizing angle for a beam incident from water to glass or that for a beam from glass to water?
3	Light is incident on a glass plate of refractive index 1.53 at polarizing angle. Calculate the angle of refraction of the ray.
4	Unpolarized light falls on a system of two polarizing sheets placed parallel to each other. What must be the angle between their transmission axes so that the intensity of light transmitted finally is $1/3^{rd}$ of the intensity of the incident light.
5	Two polaroids P_1 and P_3 are placed with their transmission axes mutually perpendicular. Another Polaroid P_2 is placed between them with its axis making an angle θ with the axis of P_1 Unpolarized light of intensity I_0 is incident on the system. Calculate the intensity of transmitted light. For what value of θ will the intensity be maximum?
6	Two Polaroids are crossed to each other. Now one of them is rotated by 60^0. What percentage of the incident unpolarized light will pass through the system?
7	The refractive indices of calcite crystal for ordinary and extra ordinary rays are 1.658 and 1.486 respectively at wavelength λ = 5890Å. Determine the thickness of the crystal for which the plate would behave as half wave plate and quarter wave plate.
8	The thickness of a calcite plate to produce polarized light is 856 nm. The refractive indices for ordinary and extra ordinary rays are 1.658 and 1.486 respectively at wavelength λ = 5890Å. Find the nature of the retardation plate.
9	Calculate the thickness of half wave plate for sodium light (λ=589.3 nm), given that μ_0=1.54 and the ratio of velocity of ordinary to extra ordinary wave is 1.007. What type of crystal is this:

	positive or negative?
10	A quartz crystal having μ_0=1.55508 and μ_e=1.5418 is used as a retardation plate. If the wavelength of light used is 546.1 nm and thickness of the plate is 0.025 mm, what is the phase retardation produced?

ASSIGNMENTS ON LASER

Module -3: Laser and Holography

Theoritical Questions:

I	aa. Define LASER. bb. Describe the properties of a LASER beam. cc. Define the following terms: (i) stimulated absorption (ii) spontaneous emission (iii) stimulated emission (iv) population inversion (v) pumping (vi) active medium (vii) optical resonator (viii) metastable state. dd. Explain the basic principals in laser action. ee. Mention the essential parts of laser. ff. How does metastable state act in laser media? gg. Establish a relation between Einstein's A and B coefficients. What are their physical significances? hh. How much higher probability of stimulated emission compared to that of spontaneous emission is achieved in laser? ii. Give one example of Solid State Laser and Gas Laser. jj. With the help of a neat diagram discuss the construction of Ruby Laser. Also discuss the operation of a ruby laser with the help of energy level diagram. kk. Explain the working principle of He-Ne laser with energy level diagram. ll. What are the advantages of He-Ne laser over a solid state laser? mm. What is the function of mirrors in Ruby and He-Ne laser? nn. Draw the energy level diagram in Ruby laser and He-Ne laser transition. oo. Mention active medium in Ruby laser and He-Ne laser transition. pp. What is the ratio of helium and neon gas in He-Ne laser? qq. State some applications of laser.

Numericals:

1	In a He-Ne laser transition from 3s to 2p level gives a laser emission of wave length 632.8 nm. If the 2p level has energy equal to 15.2 x 10^{-9} J, calculate the pumping energy required. Assume no loss.
2	Find the energy difference between the two energy levels of neon atoms of a He-Ne gas laser. The transition between these levels gives a light of wavelength 632.8 nm. Also calculate the number of photons emitted per second to give a power output of 2mW.
3	In an He-Ne laser system, the two energy levels of Ne involved in lasing action have energy values of 20.66 eV and 18.70 eV. Population inversion occurs between these two levels. What will be the wavelength of a laser beam produced? What will be the population of metastable energy level with respect to the upper excited level at room temperature (300 K)
4	A ruby laser has its metastable state at 1.79 eV from which stimulated emission produces laser light. Calculate the wavelength of the light. At room temperature when the population inversion is not achieved, calculate the ration of population of atom in metastable state to that in ground state.
5	In a lasing process the ratio of population of two energy levels out of which upper one corresponds to metastable state is 1 : 1.009 x 10^{25}. Calculate the wavelength of laser beam at 320 K.

Assignment – Quantum Mechanics

Module -4:

Q-1 Write down the main assumptions and hypothesis to derive Planck's Radiation Law. What do you understand by Ultraviolet Catastrophe?

Q-2 Derive Planck's Radiation law by calculating average energy per oscillator for any black body radiation.

Q-3 State and Derive Wien's Radiation law of black body radiation from Planck's Radiation Law.

Q-4 State and Derive Wien's displacement law of black body radiation from Planck's Radiation Law.

Q-5 State and Derive Rayleigh-Jeans law of black body radiation from Planck's Radiation Law.

Q-6 State and Derive Stefan-Boltzmann law of black body radiation from Planck's Radiation Law.

ASSIGNMENTS ON CRYSTALLOGRAPHY

Module - 5:

Theoritical Questions:

I	rr. Define the following terms: (i) space lattice (ii) basis (iii) crystal structure (iv) unit cell (v) primitive cell (vi) non-primitive cell. ss. Explain how the combination of lattice with a basis forms the crystal structure? tt. What are Miller indices? Explain with examples. What are their utilities? uu. Sketch the Miller planes: (100), (010), (001), (110), (101), (011), (111). vv. Show that in a cubic crystal of side 'a', the inter-planar spacing between consecutive parallel planes of Miller indices (hkl) is $d_{hkl} = \frac{a}{\sqrt{h^2+k^2+l^2}}$. ww. Give comparative study of (i) atomic positions (ii) effective number of atoms in a unit cell (iii) co-ordination number (iv) atomic radius in terms of lattice constant (v) packing fraction (vi) void space of SC, BCC, FCC crystal. xx. Derive a relation between lattice constant and density of the material of a cubic crystal. yy. How many crystal structures are there in 3-dimensions? Mention their lattice parameters. zz. Mention how many Bravais lattices are corresponding to each crystal system.
II	1. How can you produce continuous and characteristics X-raays. 2. Prove that the minimum wavelength of continuous X-rays produced is $\lambda_{min} = 12400/V\ A^{\circ}$, where V is the applied potential between cathode and anode. 3. Show that the minimum wavelength of continuous X-rays produced is inversely proportional to the applied potential between cathode and anode. 4. Draw the continuous and characteristic X-ray spectra for copper (Z=29), Molybdenum (Z=42) and Tungsten (Z=74).

	5. Explain-A crystal can act as a three dimensional natural grating for X-ray diffraction. 6. What are Laue spots? 7. State and explain Bragg's law of X-ray diffraction from a crystal.

Numericals:

1	A crystal has FCC structure and its atomic radius is 0.175 nm. What is the volume of the unit cell?
2	The molecular weight of KBr (FCC) is 119.01 gm-mole^{-1} and its density is 2.75 gm-cm^{-3}. Calculate the lattice constant of this crystal.
3	If the lattice constant for a BCC crystal is 3.57 A$^{\circ}$ and the density of the material of the crystal is 8575 kg-m^{-3}, find its atomic mass.
4	A crystal plane cuts at 3a, 4b and 2c along the crystallographic axes. Find Miller indices.
5	A crystal has lattice constants of 1 A$^{\circ}$, 2 A$^{\circ}$ and 3 A$^{\circ}$. A plane (321) cuts an intercept of 1 A$^{\circ}$ along x-axis. Find the intercepts along other axes.
6	A beam of 40kV strikes the copper target. Find the cut-off wavelength.
7	An X ray tube is subjected to a potential difference of 50kV. Find (i) the minimum wavelength of produced X-ray (ii) the maximum speed of striking electron.
8	A continuous X-ray spectrum of radiation is produced in an X-ray tube. The short wavelength limit of this continuous spectrum is 1.5 A$^{\circ}$. Calculate the maximum energy of an X-ray photon in the radiation.
9	If the energy levels of an atom of a material for K, L and M orbits are 68000 eV, 12000 eV and 2500 eV respectively. Find the wavelength of K_{α} and K_{β} lines.
10	An X-ray beam of wavelength 0.71 A$^{\circ}$ is diffracted by a cubic KCl crystal (FCC structure) of density 1990 kg-m^{-3}. Calculate interplaner spacing for (200) plane and glancing angle for 2nd order reflection from these planes. The molecular weight is 119.01 kg-mole^{-1}.

UNIVERSITY OF ENGINEERING & MANAGEMENT,JAIPUR

Lecture-wise Plan

Subject Name: Mathematics-I **Subject Code-M101**
Year: I[st] Year **Semester: First**

Module Number	Topics	Number of Lectures
1	**Matrix**	**11L**
	Determinant of a square matrix , Product of two determinants, Singular and non-singular matrices, Adjoint of a determinant, Trace of a matrix, Minors and Cofactors	2
	Laplace's method of expansion of a determinant	1
	Jacobi's theorem on adjoint determinant	1
	Adjoint of a matrix, Inverse of a non-singular matrix and its properties	1
	Rank of a matrix and its determination using elementary row and column operations	2
	Solution of simultaneous linear equations by matrix inversion method, Consistency and inconsistency of a system of homogeneous and inhomogeneous linear simultaneous equations	2
	Eigen values and Eigen vectors of a square matrix, Cayley-Hamilton theorem and its applications.	2
2	**Successive differentiation, Mean Value Theorems & Expansion of Functions:**	**8L**
	Successive differentiation: Higher order derivatives of a function of single variable, Leibnitz's theorem	3
	Mean Value theorems – Rolle's theorem, Lagrange & Cauchy	2
	Taylor's theorem with Lagrange's and Cauchy's form of remainders and its application, Expansions of functions by Taylor's and Maclaurin's theorem	1
	Maclaurin's infinite series expansion of the functions: sin x, cos x, e(x), log(1+ x), $(a + x)^n$, n being an integer or a fraction	2
3	**Calculus of Functions of Several Variables:**	**9L**
	Introduction to functions of several variables with examples, Knowledge of limit and continuity	1
	Partial derivatives and related problems, Chain rules, Differentiation of implicit functions	2
	Homogeneous functions and Euler's theorem and related problems up to three variables	1
	Total differentials and their related problems, Jacobians up to three variables and related problems. Maxima and minima	4
4	**Infinite Series**	**6L**
	Infinite Series: Preliminary ideas of sequence, Infinite series and their convergence/divergence,	4

	Infinite series of positive terms,Tests for convergence: Comparison test, Cauchy's Root test, D' Alembert's Ratio test and Raabe's test	
	Leibnitz theorem for alternating infinite series, Absolute convergence and Conditional convergence.	2
5	**Vector Algebra and Vector Calculus: Scalar and vector fields**	**9L**
	Definition and terminologies, dot and cross products, scalar and vector triple products and related problems	1
	Differentiation of a vector function, Scalar and vector point functions	1
	Gradient of a scalar point function, divergence and curl of a vector point function	3
	Directional derivative Related problems on these topics	1
	Green's theorem, Gauss Divergence Theorem and Stoke's theorem	3

Assignment:
Module-1:

1. Find the x, y, z and w given that

$$3\begin{bmatrix} x & y \\ z & w \end{bmatrix} = \begin{bmatrix} x & 6 \\ -1 & 2w \end{bmatrix} + \begin{bmatrix} 4 & x+y \\ z+w & 3 \end{bmatrix}$$

2. Statement of Cayley-Hamilton Theorem.

3. Compute the determinant of the matrix $A = \begin{bmatrix} 1 & 6 & -1 & -2 \\ -2 & 3 & 2 & -2 \\ 3 & 5 & -1 & 2 \\ 1 & -6 & 4 & 7 \end{bmatrix}$ using Laplace expansion.

4. Find the Rank of the Matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 4 & 5 \end{bmatrix}$

5. Find the characteristics equation of the Matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$ use Cayley-Hamilton theorem to find its inverse.

6. Find the Eigen value and Eigen vector of the Matrix $A = \begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -4 & -3 \end{bmatrix}$.

7. Find the solution of Homogeneous system of equations
$x+2y+3z=0, 2x+3y+z=0, 3x+y+2z=0$

8. If $D_r = \begin{vmatrix} r & x & \frac{n(n+1)}{2} \\ 2r-1 & y & n^2 \\ 3r-2 & z & \frac{n(3n-1)}{2} \end{vmatrix}$ then $D_r = ?$

9. Test the consistency of the following equations and find its solutions
$x+y+z=6, x-y+2z=5, 3x+y+z=8, 2x-2y+3z=7$

Module-2:

1. Find y_n, where $y = \frac{1}{x^2+a^2}$
2. If $x^m y^n = (x+y)^{m+n}$, prove that $\frac{dy}{dx} = \frac{y}{x}$.
3. If $y = a\cos(\log x) + b\sin(\log x)$ the show that
   $x^2 y_2 + xy_1 + y = 0$ $x^2 y_{n+2} + (2n+1)xy_{n+1} + (n^2+1)y_n = 0$
4. Show that if $-1 < x < 1$,
   $(1+x)^{\frac{1}{3}} = 1 + \frac{1}{3}x - \frac{1}{9}x^2 + \frac{5}{81}x^3 - \frac{10}{243}x^4 + R_5$
   where $R_5 = \frac{x^5}{4!}(1-\theta)^4 \frac{880}{243}(1+\theta x)^{\frac{-14}{3}}$.
5. Expand $\cos x$ in a finite series (in power of x) in Lagrange's form of remainder.

Module-3:

1. Show that the function f (x) = x | x | is differentiable at 0. More generally, if f is continuous at 0, then g(x) = xf (x) is di erentiable at 0.
2. Show that among all triangles with given base and the corresponding vertex angle, the isosceles triangle has the maximum area.
3. If $y_1 = \frac{x_2 x_3}{x_1}$, $y_2 = \frac{x_3 x_1}{x_2}$, $y_3 = \frac{x_1 x_2}{x_3}$ show that the Jacobian y_1, y_2, y_3 of with respect to x_1, x_2, x_3 is 4.
4. Show that the function $f(x,y) = x^3 + y^3 - 63(x+y) + 12xy$ is maximum at $(-7,-7)$ and minimum at $(3,3)$.
5. If $u = \sin^{-1}\left[\frac{x^3+y^3+z^3}{ax+by+cz}\right]$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 2\tan u$.
6. If $u = u\left[\frac{y-x}{xy}, \frac{z-x}{xz}\right]$, show that $x^2\frac{\partial u}{\partial x} + y^2\frac{\partial u}{\partial y} + z^2\frac{\partial u}{\partial z} = 0$.

Module-4:

1. Test the convergence of the series $x-\frac{x^2}{\sqrt{2}}+\frac{x^3}{\sqrt{3}}-\frac{x^4}{\sqrt{4}}+..........$
2. Test the series $\frac{1}{2\sqrt{1}}+\frac{x^2}{3\sqrt{2}}+\frac{x^3}{4\sqrt{3}}+\frac{x^6}{5\sqrt{4}}+.........\infty$.
3. Is this series $\sum_{n=1}^{\infty}(-1)^{n-1}\left(\frac{1}{n\sqrt{n}}\right)$ absolutely convergent?
4. Test the convergency of the series: $\frac{6}{1.3.5}+\frac{8}{3.5.7}+\frac{10}{5.7.9}+\cdots\ldots\ldots\ldots$
5. Test the convergency of the series :-
   a. $1-\frac{1}{\sqrt{2}}+\frac{1}{\sqrt{3}}-\frac{1}{\sqrt{4}}+..........$
   b. $\sum_{n=1}^{\infty}\frac{(-1)^n}{2n-1}$

Module-5:

1. Verify Divergence theorem given that the $\vec{F}=4xz\hat{i}-y^2\hat{j}+yz\hat{k}$ and s is the surface of the cube bounded by the planes $x=0$, $x=1$, $y=0$, $y=1$, $z=0$, $z=1$.
2. Find the Directional derivative of the function $\Phi=x^2-y^2+2z^2$ at the point $p(1,2,3)$ in the direction of the line PQ where Q is the point $(5,0,4)$.
3. Evaluate $\int_c \vec{F}.d\vec{r}$ by stoke's theorem, where $\vec{F}=(x^2+y^2)\hat{i}-2x\hat{j}$ and C is boundary of the rectangle $x=\pm a$, $y=0\ \&\ y=b$.
4. If $r=|\vec{r}|$ where $\vec{r}=x\hat{i}+y\hat{j}+z\hat{k}$, prove that $\vec{\Delta}(r^n)=nr^{n-2}\vec{r}$.
5. What will be the value of p for which the vector field $\vec{v}=(2x+y)\hat{i}+(3x-2z)\hat{j}+(x+pz)\hat{k}$ is solenoidal ?
6. Given the statement of Green's theorem.

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Lecture-wise Plan

Subject Name: Basic Electrical and Electronics Engineering-I **Subject Code-ES101**
Year: 1st Year **Semester: First**
Basic Electrical Engineering:

Module Number	Topics	Number of Lectures
1	**Semiconductors:**	**4L**
	1. Crystalline material: Mechanical properties, Energy band theory, Fermi levels .	1
	2. Conductors, Semiconductors and Insulators: electrical properties, band diagrams. Semiconductors	1
	3. intrinsic and extrinsic, energy band diagram, electrical conduction phenomenon, P-type and N-type semiconductors	1
	4. drift and diffusion carriers.	1
2	**Diodes and Diode Circuits:**	**6L**
	1. Formation of P-N junction, energy band diagram.	1
	2. built-in-potential forward and reverse biased P-N junction, formation of depletion zone-I characteristics, Zener breakdown, Avalanche breakdown and its reverse characteristics.	2
	3. Junction capacitance and Varactor diode	1
	4. Simple diode circuits, loadline,linear piecewise model. Rectifier circuits: half wave, full wave, PIV,DC voltage and current, ripple factor, efficiency, idea of regulation.	2
3.	**Bipolar Junction Transistors:**	**8L**
	1. Formation of PNP / NPN junctions, energy band diagram	2
	2. transistor mechanism and principle of transistors, CE, CB, CC configuration, transistor characteristics: cut-off active and saturation mode, transistor action	2
	3. injection efficiency, base transport factor and current amplification factors for CB and CE modes.	2
	4. Biasing and Bias stability: calculation of stability factor	2
Total Number Of Hours = 18		

Faculty In-Charge HOD, ECE Dept.

Assignment:

Module-1(Semiconductors):

1. Explain the differences among conductors, insulators and semiconductors using the Energy Band Diagrams.
2. Define (i) Mass action law (ii) Mobility and (iii) Conductivity
3. Explain how conduction takes place in intrinsic semiconductor.
4. What is doping? Explain how N and P-type semiconductors are formed.
5. Explain how conductivity changes with doping.
6. What is Fermi level? Explain the effect of doping and temperature on Fermi level.
7. An n-type Silicon bar 0.1 cm long and 100 μm^2 in cross-sectional area has a majority carrier concentration of 5×10^{20} / m 3 and the carrier mobility is 0.13 m^2 /V-s at 300k. If the charge of an electron is 1.6×10^{-19} C, then find the resistance of the bar.
8. Show that the Fermi level is at the centre of forbidden gap in an intrinsic semiconductor. State what happens to the Fermi level of N-type and P-type semiconductors by referring to expressions concerned.
9. Explain Drift and diffusion currents with reference to a semiconductor.

Module-2(Diodes and Diode Circuits):

1. Explain how the depletion region is formed at a pn-junction.
2. Explain the operation of the p-n diode in forward and reverse bias modes. Also plot the V-I characteristic curve for Si and Ge diodes.
3. What is reverse saturation current ? Mention approximate order for Ge and Si diodes.
4. Explain breakdown mechanisms that occur in a p-n junction diode.
5. How many types of capacitances are associated with pn-junction? Explain which type of capacitance is important for forward and reverse bias modes of operation.
6. Draw the circuit diagram and explain the working of Half Wave Rectifier (HWR).
7. Derive expressions for ripple factor (r), rectification efficiency (η) of HWR and PIV of the diodes to be used.
8. The primary to secondary turns ratio of a transformer used in a HWR is 20:1. If the Primary is connected to the power mains: 220V, 50Hz, calculate D.C voltage across the 1KΩ load resistor. Also find the diode current.
9. With the help of a neat circuit diagram explain the working principle of a centre tapped Full Wave Rectifier.
10. Derive expressions for ripple factor (r), rectification efficiency (η) of a Full Wave Rectifier (FWR) and the PIV of the diodes to be used.
11. With the help of a neat circuit diagram explain the operation of a Bridge Rectifier. Also define PIV and find PIV for HWR, Centre tapped FWR and Bridge Rectifier.
12. Compare the performance of HWR, Centre-tapped FWR and Bridge Rectifier. Mention the advantages and disadvantages of Centre-tapped FWR and Bridge rectifiers [You are expected to compare them based on parameters (i) Number of diodes required, (ii) Vdc , (iii) v rms , (iv) ripple factor, (v) max rectification efficiency, (vi) PIV of diodes, (vii) ripple frequency and (viii) other parameters

Module-3(Bipolar Junction Transistors):

1. Explain Why ordinary junction transistor is called bipolar?
2. Why transistor is called current controlled device?
3. Discuss the need of biasing?
4. What is importance of Q point ? What is Load line.
5. Why CE configuration is most popular in amplifier circuits?
6. Explain how BJT used as an amplifier.
7. Define alpha and bita of transistor. How they relate?
8. Draw and explain input output characteristic of CE mode of transistor.
9. Draw and explain input output characteristic of CB mode of transistor.
10. Derive the stability factor of self bias circuit.

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Lecture-wise Plan

Basic Electronics Engineering-I

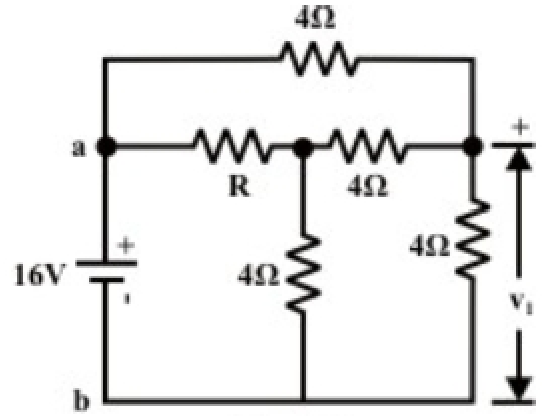
Module Number	Topics	Number of Lectures
1	**Electrical Engineering fundamentals:**	**6L**
	1. Concepts of electrical systems, elements and networks.	1
	2. KVL, KCL	1
	3. Superposition theorem, Thevenin theorem, Norton theorem,	3
	4. Maximum Power transfer theorem	1
2	**AC fundamentals:**	**7L**
	1. Concepts of AC voltage and current, average, peak and rms value of voltage and current	2
	2. AC power, Power factor, impedance in ac circuits	2
	3. Impedance triangle, power triangle, phasors	3
	Resonance:	**6L**
3.	1. Concept of resonance in RLC circuit	**1**
	2. Series resonance	2
	1. Parallel resonance	2
	2. Q factor	**1**
4	**Electromagnetism:**	**7L**
	1. Fundamental principles of electromagnetism, Biotsavart law, Amepere law.	3
	2. Faradays principles of electromagnetic induction, Lenz' law, electric and magnetic circuit	4
Total Number Of Hours = 27		

Faculty In-Charge HOD, EE Dept.

Assignment:

Module-1:

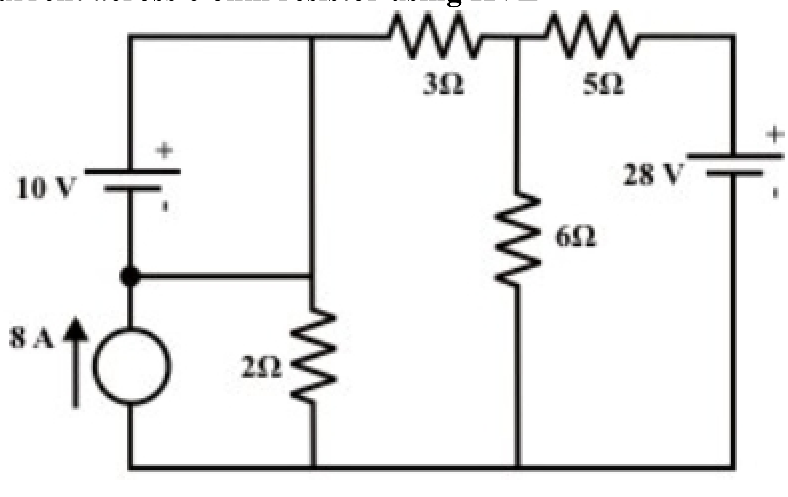
10. **Determine the value of 'R' when v1 = 8V, also determine the value of Rab.**



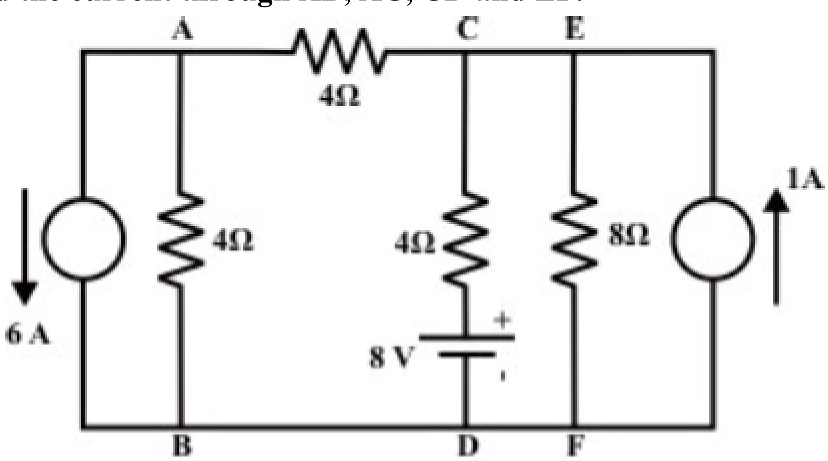
11. **Explain causal and non causalsytems.**

Module-2 :

13. **Find the current across 6 ohm resistor using KVL**

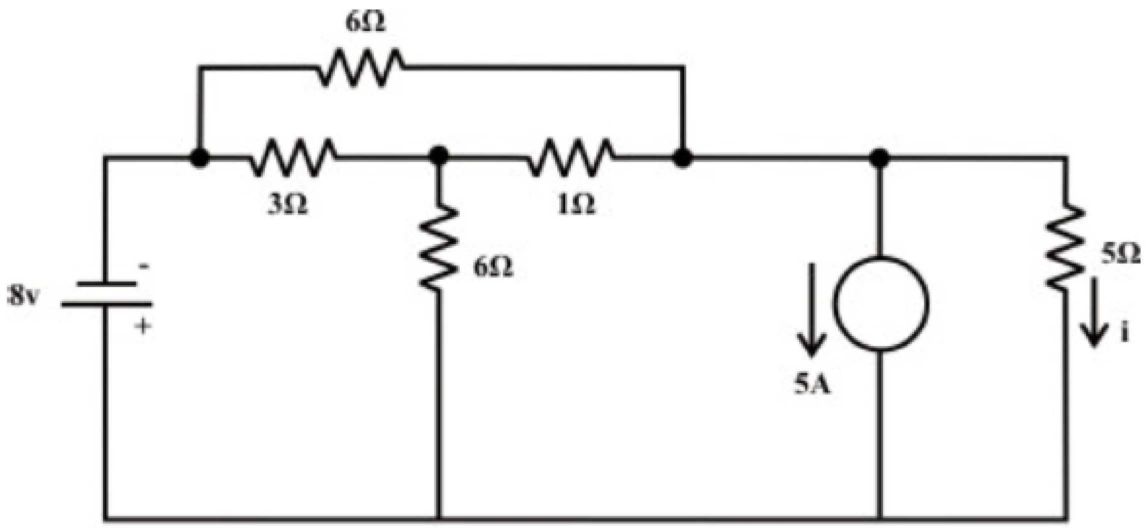


14. **Find the current through AB, AC, CD and EF.**

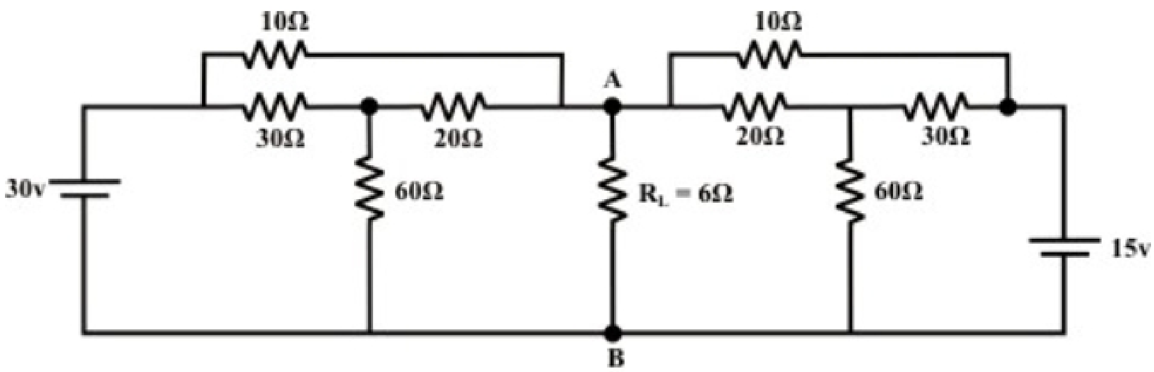


Module-3:

1. Using Superposition theorem find the current through 5 ohm resistor.



2. Find the current through RL using Norton theorem



3. Find the value of R for maximum power transfer against the figure and table shown

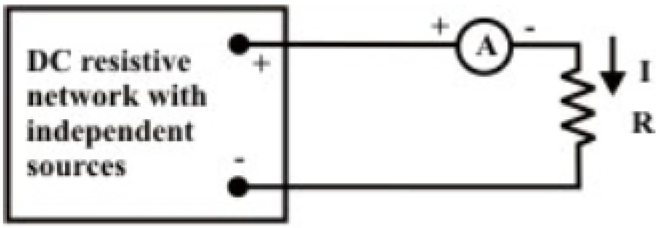


Fig. 8.15

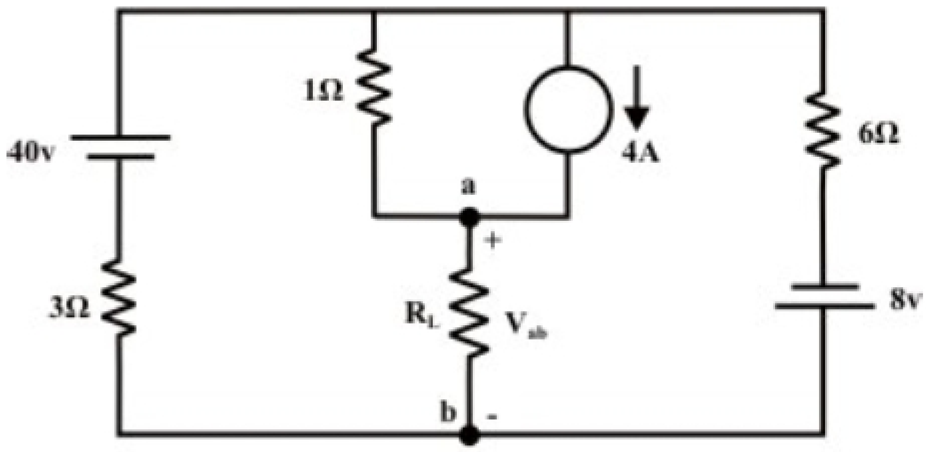
Table

R	I
10Ω	2 A
80Ω	0.6 A

Module 3:

1.A coil having resistance of 20 ohm and inductance of 20mH in series with a capacitor is fed from a constant voltage variable frequency supply. The maximum current is 10A at 100 Hz. Find the two cut off frequencies, when the current is 0.71 A.

2. Determine the maximum power when RL =3 ohm for the given circuit



UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Lecture-wise Plan

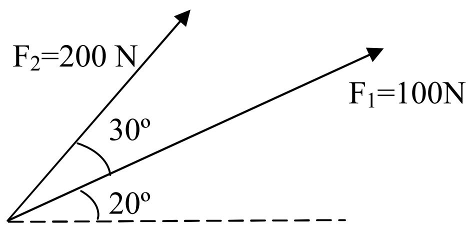
Subject Name: Engineering Mechanics **Subject Code-ME101**
Year: 1st Year **Semester: First**

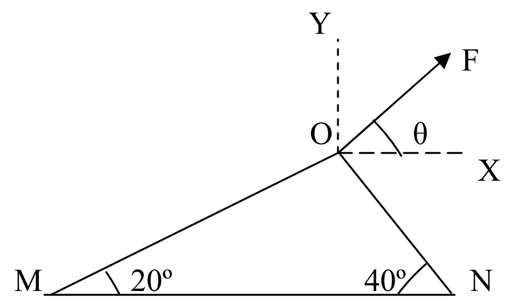
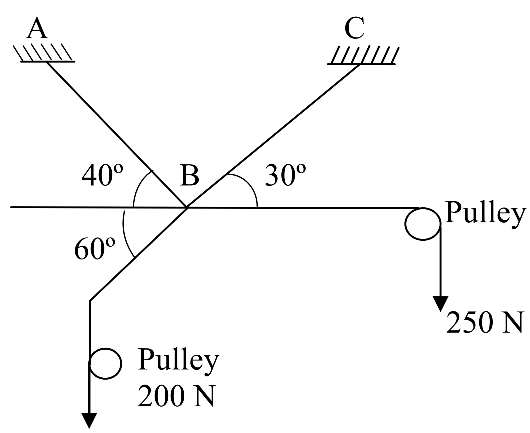
Module Number	Topics	Number of Lectures
1	**Introduction:**	**12L**
	1. Importance of Mechanics in engineering	1L
	2. Introduction to Statics; Particle and Rigid Body	1L
	3. Types of forces	1L
	4. Addition and subtraction of vectors	2L
	5. Lami's theorem and types of vectors	2L
	6. Cross product and Dot product	2L
	7. Resolution of forces	2L
	8. Moment, Varignon's theorem & Couple	1L
2	**Friction:**	**9L**
	1. Concept and Equilibrium of forces in 2-D	1L
	2. Free body concept and diagram	1L
	3. Equations of equilibrium	3L
	4. Concept of Friction; Laws of Coulomb friction	1L
	5. Angle of Repose and Coefficient of friction	3L
3	**Centroid & centre of gravity:**	**10L**
	1. Centroid and Centre of Gravity	1L
	2. Centroids of a triangle, circular sector	1L
	3. Moments of inertia	3L
	4. Parallel/Perpendicular axis theorem	1L
	5. Mass moment of inertia of symmetrical bodies	2L
	6. Concept of simple stresses and strains	2L
4	**Dynamics:**	**5L**
	1. Introduction to Dynamics	1L
	2. Newton's laws of motion Law of gravitation	2L
	3. Rectilinear motion of particles	2L
5	**Energy:**	**4L**
	1. Kinetics of particles & Equation of motion	1L
	2. D Alembert's principle and FBD	1L
	3. Principle of work and energy	2L
Total Number Of Hours = 40		

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

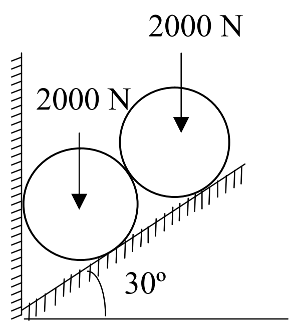
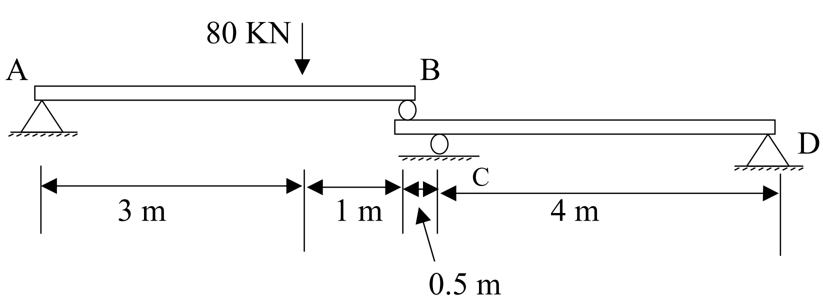
Lecture-wise Plan

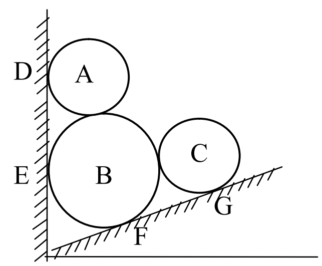
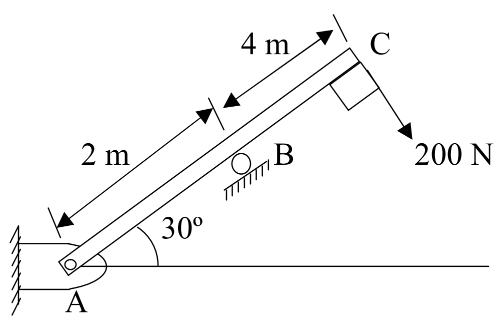
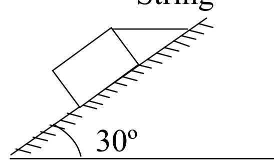
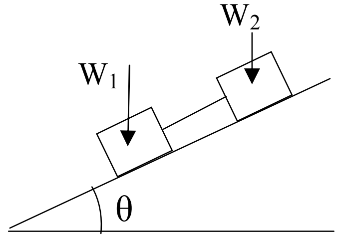
Assignment 1

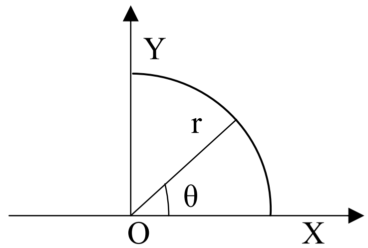
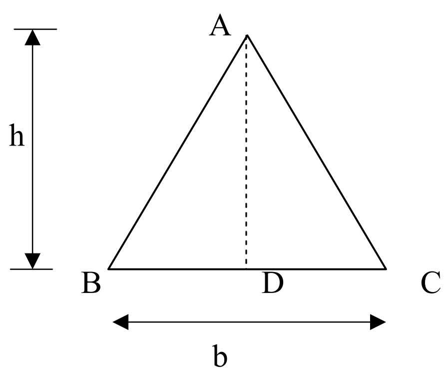
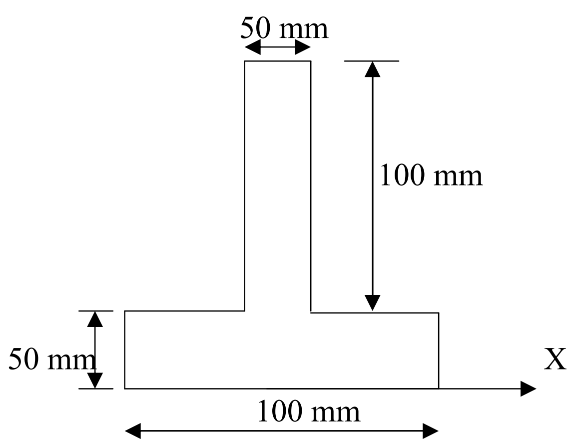
Q1	Two forces of magnitude 15 N and 20 N are acting at a point. If the angle between the two forces is 60º, determine the magnitude and angle of resultant force.
Q2	The resultant of two forces F_1 and F_2 is at right angles to F_1. Determine the angle between forces.
Q3	In a concurrent force system, two forces are acting at a point at angle 60°. The resultant force is 150 N and on e of the forces is 100 N. Determine the unknown force.
Q4	The resultant of two forces when they act at 60º is 25 N. If the same forces are acting at right angles, their resultant is 22 N. Determine the magnitude of two forces.
Q5	Two forces are acting at a point O as shown in fig.. Determine the magnitude of the resultant and also the direction. 
Q6	Two forces F and 2F act at a particle, when the first force is increased by 100 N and the second force is doubled, the direction of resultant remains the same. Determine the value of force F.
Q7	Two forces one of which is doubled and the other has resultant of 250 N. If the direction of the larger force is reversed and the other remains unaltered, the resultant reduces to 160 N. Determine the magnitude of the forces and the angle between the forces.
Q8	The resultant of two forces P and Q acting at an angle θ is equal to $(2m + 1)\sqrt{(P^2 + Q^2)}$ and when they act at an angle (90 – θ), the resultant is $(2m - 1)\sqrt{(P^2 + Q^2)}$. Prove that $\tan\theta = \frac{n-1}{n+1}$
Q9	Two forces F_1 and F_2 acting at a point have a resultant R. If F_2 is doubled, R is doubled. Again if the direction of F_2 is reversed, R is doubled. Show that $F_1:F_2:F_3 = \sqrt{2}:\sqrt{3}:\sqrt{2}$

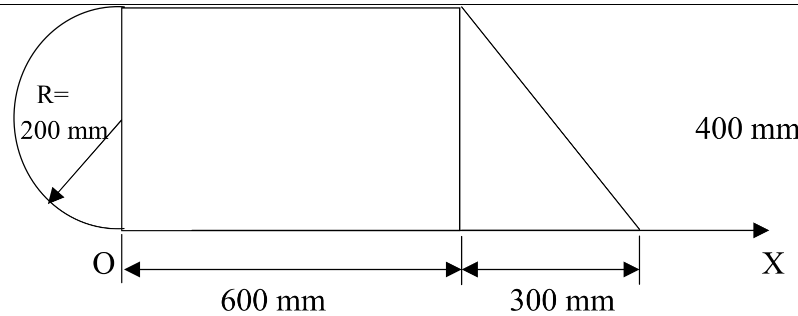
Q11	Two strings are tied together at O as shown in fig., if the maximum possible tension in each rope is 4 KN. What is the maximum force F that can be applied and in what direction. 
Q12	Determine the tensile force in cables AB and BC as shown in fig. Assume the pulleys to be frictionless. 
Q13	State and explain parallelogram law of forces.
Q14	State and prove Lami's theorm.
Q15	Two forces are given by $6i + 10j - 5k$ and $5i + 2j + 10k$. Prove the two forces are perpendicular to each other.
Q16	Determine the cross product of vectors $F_1 = 4i - 5j - 3k$ and $F_2 = 4i + 5j - 6k$ and the

	angle between them.
Q17	Two forces are given by the equations $F_1 = 2i - 3j - k$ and $F_2 = -6i + 9j + 3k$. Prove that two forces are parallel.
Q18	A force vector is equal to 2i + 3j – k. The point of application of this force moves from the point 2i – j + k to the point 3i + j – k. Determine the work done by the force.
Q19	A vector A is equal to 3i – 2j + 2k. Find the projection of this vector on the line joining points P (1,2,-3) and Q (-1,-2,2).
Q20	Three vectors A,B and C are given by A= i + j – 2k, B = 4i + 3j - 2k and C = 2i + j + k. Determine the resultant vector and a unit vector in the direction of resultant.

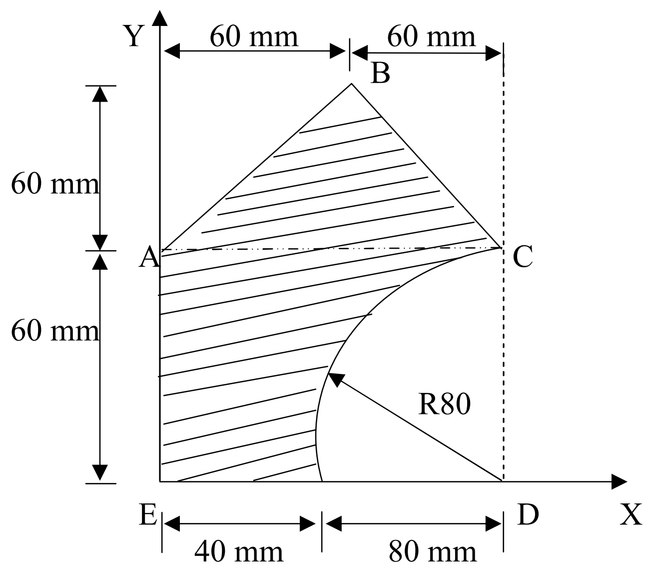
	Assignment - 3
1	Two identical rollers, each of weight 2000 N are supported by inclined plane and a vertical wall as shown in figure. Determine the reaction at supports. Assume all the surfaces to be smooth. 
2	Determine the reaction at supports A, C and D in the structure as shown in figure. 
3	Three uniform homogenous smooth spheres A, B and C of weight 300 N, 600 N and 300

	N and having diameters 800 mm, 1200 mm and 800 mm respectively are placed in an inclined plane as shown.Determine the reaction at contact points D, E, F and G. 
4	A beam with hinged support and roller support is subjected to a force as shown in figure. Determine the support reaction. 
5	A block is resting on a rough inclined plane as shown in figure. The block is tied up by a horizontal string which has a tension of 20 N. If the weight of block = 70 N, determine a) frictional force on the block b) normal reaction of inclined plane c) coefficient of friction between contacting surfaces. 
6	Two blocks of weight W_1 and W_2 rest on a rough inclined plane and connected by a string. The coefficient of friction between these blocks and plane are μ_1 and μ_2 respectively. Show that the blocks will be on the point of motion when the inclination of plane with the horizontal is given by $\tan\theta = \frac{\mu_1 W_1 + \mu_2 W_2}{W_1 + W_2}$ 

7	Determine the centroid of quarter circular arc of radius R. 
8	Determine the centroid of triangle of size b x h. 
9	Determine the centroid of semi circular area of radius R.
10	Determine the centroid of quarter circular area of radius R.
11	Determine the centroid of T section as shown in figure. 
12	Determine the centroid of area as shown in figure with respect to the axes indicated in figure. 

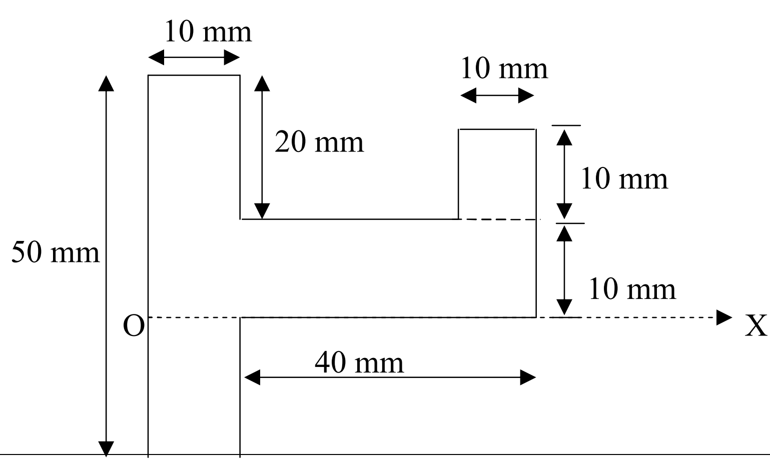


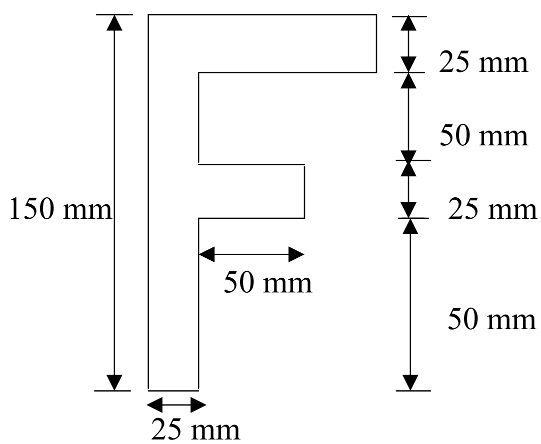
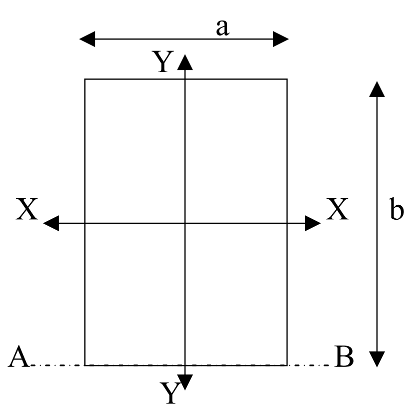
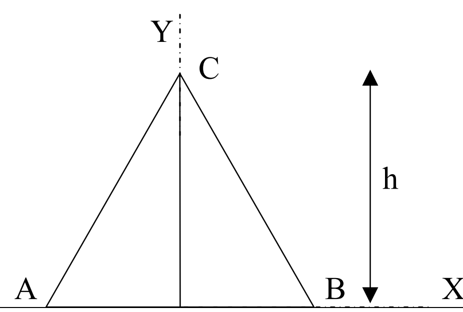
13 Determine the centroid of shaded area as shown in figure

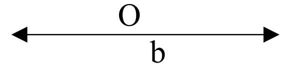
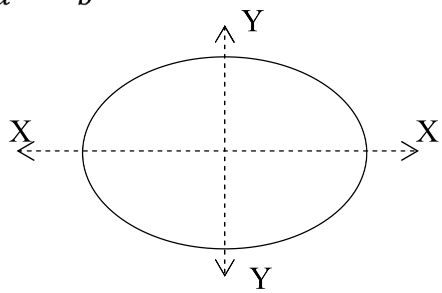
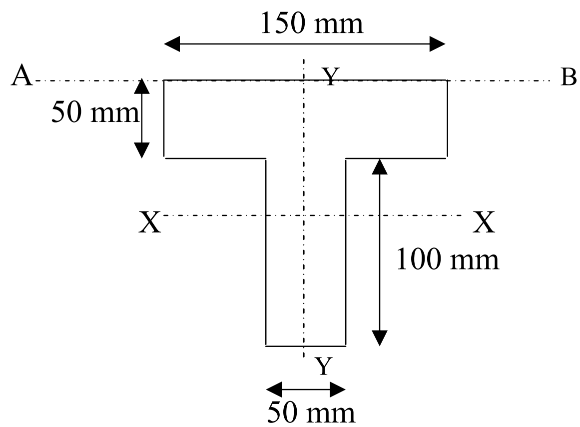


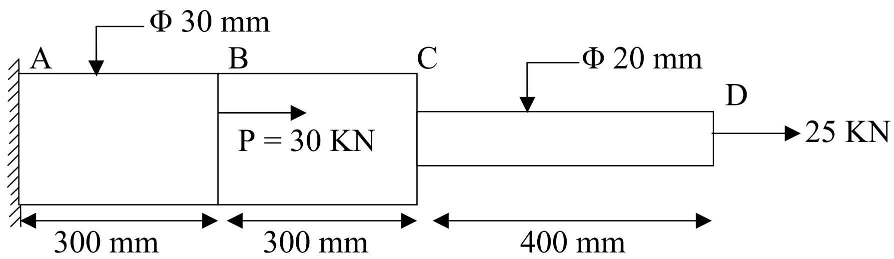
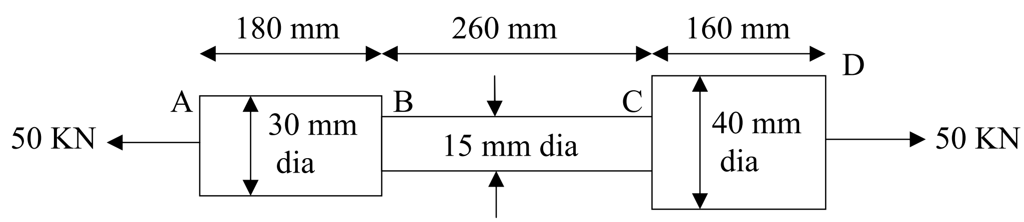
Assignment 4

1 Determine the centroid of plane area as shown in figure



2	Determine the centroid of given F section as shown in figure. 
3	Differentiate between centre of mass, centre of gravity and centroid of a given body.
4	Explain the following terms: a) Mass moment of Inertia b) Radius of Gyration
5	Determine the moment of inertia of a rectangle of sides a and b about centroidal axis and also about axis AB as shown in figure. 
6	Determine the moment of inertia of a triangle with base b and height h about axis OX and OY and also about centroidal axis as shown in figure. 

	
7	Determine the moment of inertia with respect to X-X axis for area enclosed by ellipse whose equation is $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ 
8	Determine the moment of inertia of T section as shown in figure about an axis passing through centroid and parallel to topmost fibre of section. 
9	State and prove a) Parallel Axis Theorem b) Perpendicular Axis Therorem
10	Determine the moment of inertia of solid sphere of radius R about its diametral axis.
Assignment 5	
1	Explain the following terms: a) Stress b) Strain c) Volumetric Strain d) Elasticity

	e) Hooke's Law f) Poisson's Ratio
2	Derive a relation for Volumetric strain for a rectangular bar in terms of strain along length, width and thickness.
3	The composite bar shown in figure is made of steel in portion AC and copper in portion CD. The two materials are rigidly joined at C. Find the extension of bar under loading as shown in figure. Take $E_s = 2 \times 10^5$ N/mm^2, $E_c = 1.1 \times 10^5$ N/mm^2. 
4	A bar consists of three parts as shown in figure. Find the stresses in parts and total extension of the bar for an axial load of 50 KN. Take $E = 2 \times 10^5$ N/mm^2. 

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Lecture-wise Plan

Subject Name: Basic Computation &Principles of Computer Prog. -I **Subject Code: CS101**
Year: 1st Year **Semester: First**

Module Number	Topics	Number of Lectures
1	**Introduction to Computers**	**2**
	1. Generations, Classifications, Applications, Basic Organization, Input and output devices	1
	2. Basic concept of Computer memory, Computer software and networks	1
2	**Number system**	**4**
	1. Decimal, Binary, Octal, Hexa-decimal, Conversion of numbers, Addition and subtraction of two numbers, Two's compliment	2
	2. Multiplication and division of binary numbers, Working with fractions, signed number representation in binary form	1
	3. Logic gates	1
3	**Introduction to C**	**4**
	1. compiling and executing C programs, using comments, keywords, identifiers, Data type, variables, constants	1
	2. input/output statements in C, operators in C	2
	3. type conversion and type casting.	1
4	**Decision Control and looping statements**	**6**
	1. conditional branching statement	2
	2. iterative statements	2
	3. nested loops, break and continue statements, goto statement	2
5	**Arrays & Strings**	**6**
	1. Declaration, accessing elements of array, storing values	1
	2. calculating the length of array, two dimensional arrays	1
	3. reading and writing strings, suppressing input, string taxonomy	1
	4. string operations – using and without using library function	2
	5. array of strings	1
6	**Functions**	**5**
	1. Declaration, prototype, definition, function call	1
	2. return statement, passing parameters to the function	1
	3. scope of variable, storage classes	1
	4. recursive functions	2
7	**Pointers**	**7**
	1. introduction, declaration, Pointer expression and arithmetic	1
	2. null pointer, generic pointer, passing arguments to functions using pointer	1
	3. pointers and arrays, passing an array to function, difference between array name and pointer	2
	4. pointers and strings, array of pointers	1
	5. function pointers, pointers to pointers	1
	6. dynamic memory allocation, drawbacks	1

8	**Structure-union, Files, Preprocessor directives**	**4**
	1. Structure, nested structure, array of structure 2. union, array of union variable, unions inside structure 3. Files – Reading –writing etc 4. Preprocessor directives	1 1 1 1
Total Lecture Hours – 37 l.h.		

Faculty In-Charge HOD, CSE Dept

Assignments :

Unit 1:- (Introduction to Computers)

1. How is OCR technology better than ordinary image scanner?
2. How does MICR technology help to detect fraud in check payment?
3. Which factors will you consider while purchasing a monitor for your personal computer?
4. What is a head crash? How does it occure?
5. What is USB flash drive?
6. What is a BIOS? Which kind of memory is preferred in it, and why?
7. How is application software is different from system software?
8. Classify the operating systems based on their capabilities.
9. In what situation must the network have a gateway?
10. Which device will you prefer to form a network – hub or a switch? Justify your answer.

Unit 2 :- (Number system)

1. How can two numbers be subtracted only through addition? Explain with example.
2. Convert the following –
    a) (10110101)2 – (?)10
    b) (5674)8 – (?)10
    c) (A1E2)16 – (?)10
    d) (289)10 – (?)8
    e) (593)10 – (?)2
    f) (36541)8 – (?)16
3. 10101011 – 01111 = ?
4. 11100001 + 11111110111 = ?
5. 1111000 / 100 = ?
6. Why NAND gate is known as universal gate?

Unit 3 :- (Introduction to C)

1. State true or false – a> $amount is a valid identifier in C,

b> The equality operators have higher precedence than the relational operators.
c> Signed variables can increase the maximum positive range.
d> printf(“%d”, scanf(“%d”,&num)); is valid statement
e> The modulus operators can be used only with integers

2. Write a program to prepare a grocery bill. For that enter the name of the items purchased, quantity in which it is purchased, and its price per unit. Then display the bill in the following format

   ****************************BILL*******************************

Item	Quantity	Price	Amount
Total amount to be paid			

3. Write a program to read two floating point numbers. Add these numbers and assign the result to an integer. Finally display the value of all the three variables.
4. Find the error(s) –
```
Int n;
float a b;
double = a, b;
complex a b;
a,b : INTEGER
long int a;b;
```
5. Find the error(s) –
```
int a = 9;
float y =2.0;
a = b% a;
printf(“%d”, a);
```
6. Write the output of the code →
```
int main()
{
int a = 2,b =3, c = 4;
a=b=c;
printf(“a=%d”,a);
return 0;
}
```
7. Evaluate the expression – (x > y) + ++a || !c
8. Write a program to count the number of vowel in a given text.
9. Why do we include <stdio.h> in our program?
10. Write a program to calculate simple and compound interest .

Unit 4 :- (Decision Control and looping statements)

1. Change the following for loop into do-while loop
```
int i;
for(i=10 ; i>0 ; i--)
```

printf("%d", i);

2. WAP to accept any number and print the number of digits in that program.
3. WAP to print the sum of all odd numbers from 1 to 100.
4. WAP that displays all the numbers from 1 to 100 that are not divisible by 2 as well as by 3.
5. Write down the output
```
#include<stdio.h>
main()
{ int num = 10;
 for(;;--num)
printf("%d", num);
}
```
6. Find errors
```
#include<stdio.h>
main() {
int i,j;
for (i=1,j=0 ; i+j <=10 ; i++)
printf("%d", i);
j+=2;
}
```
7. WAP to print the pattern →
```
a> $ * * * *
    *$  * * *
    * * $ * *
    * * * $ *
    * * * * $
b>  @
    @ @
    @ @ @
    @ @ @ @
    @ @ @ @ @
    @ @ @ @
    @ @ @
    @ @
    @
```
8. WAP to print the sum of the following series →

   a> 1 + (1+2) – (1+2+3) + (1+2+3+4) - ....

   b> $-x + x^2 - x^3 + x^4$ .....

Unit 5 :- (Arrays)

1. How are multi dimensional arrays useful?
2. What happens when an array is initialized with (a) fewer initializers as compared to its size? (b) more initializers as compared to its size?
3. For an array declared as int arr[50], calculate the address of arr[35], if base(arr) = 1000 and w =2.
4. Write a program that reads a square matrix of size n x n. Write a function int isUpperTraingular(int[][],int n) that returns 1 if the matrix is upper triangular.

5. WAP to read two floating point arrays. Merge these arrays and display the resultant array.
6. WAP to display the word HELLO in the following format

```
H
H E
H E L
H E L L
H E L L O
```

7. Wap to count the number of charecters, words and lines in the given text.
8. WAP to find the last instance of occurrence of a given string.
9. Write a program to display a list of candidates. Prompt 100 users to cast their vote. Finally display the winner in the election.
10. In a class there are 20 students. Each student is supposed to appear in three tests and two quizzes throughout the year. Make an array that stores the names of all these 20 students. Make five arrays that stores marks of three subjects as well as scores of two quizzes for all the students. Calculate the average and total marks of each student. Display the result.

Unit 6 :- (Functions)

1. How many types of storage classes does the C language support? Why do we need different types of such classes?
2. What is the difference between formal and actual parameters?
3. Write a function to reverse a string using recursion.
4. What will happen when the actual parameters are less than the formal parameter in a function?
5. WAP to compute $F(x , y)$ where $F(x , y) = F(x – y , y) + 1$ if $y <= x$ and $F(x , y) = 0$ if $x < y$.
6. Write a function to draw the following pattern on the screen

```
* * * * * * * *
!             !
!             !
!             !
* * * * * * * *
```

7. Write a function to print a table of bionomial coefficients which is given by the formula

   $B(m , x) = m ! / (x ! (m – x)!)$ where $m > x$,

   hint : $B (m , 0) = 1$, $B (0 ,0) = 1$, and $B (m, x) = B (m, x-1) * [(m – x + 1) / x]$

8. Write a program to swap two integers using Call by Value method of passing arguments to a function.
9. Find the output –

```
#include<stdio.h>
int prod (int x, int y)
```

```
{
 return (x * y);
}
main()
{
int x = 2, y = 3, z;
z = prod (x, prod(x,y) );
printf("%d",z);
return 0;
}
```

10. Find the output

```
#include <stdio.h>
int a;
static int func()
{
return  a++;
}
main()
{
a = 10;
printf("%d", func() );
a*= 10;
printf("%d", func() );
return 0;
}
```

Unit 7 :- (Pointers)

1. Explain the result of the following code

```
int num1 = 2, num2 =3;
int *p = &num1, *q = &num2;
*p++ =*q++;
```

2. What do you understand by null pointer? Discuss with example.
3. Differentiate between ptr++ and *ptr++.
4. Can we subtract two pointer variables?
5. Can array names appear on the left side of the assignment operator? Why ?
6. WAP to print the lowercase letters into uppercase characters and the vice versa in the given string – "HappY NeW YeaR.".
7. What is a dangling pointer?
8. What do you mean by wild pointer?
9. With the help of an example, explain how pointers can be used to dynamically allocate space for 2 D and 3D arrays.
10. State true or false—
    a. Only one call to free() is enough to release the entire array allocated using calloc().
    b. Ragged arrays consumes less memory space.

c. *ptr++ will add 1 to the value pointed by ptr.
d. Pointer constants cannot be changed.
e. Adding 1 to a pointer variable will make it point 1 byte ahead of the memory location to which it is currently pointing.

Unit 8 :- (Structure, union, Files, Preprocessor directives)

1. What do you mean by nested structure? Discuss.
2. Differentiate between structure and union.
3. WAP to create a structure with information given below. Then read and print the data.
   Employee[10]
   (a) Emp_id
   (b) Name
      (i) First name
      (ii) Middle Name
      (iii) Last Name
   (c) Address
      (i) Area
      (ii) City
      (iii) State
   (d) Age
   (e) Salary
   (f) Designation.
4. WAP to read data from the keyboard and write it to a file. Read the contents stored in the file and display it on the screen.
5. WAP to copy a file using feof().
6. Can we have a C program that does not use any pre-processor directive?
7. What happens when the argument passed to the macro has multiple white space characters?

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR
Lab Manual

Title of Course: Physics-I Lab
Course Code: PH191
L-T-P scheme: 0-0-3 **Course Credit: 2**

Objectives:

Engineering Physics students will:

- Excel in technical careers and thrive in graduate studies using scientific principles and application of physical sciences
- Work effectively in bringing multi-disciplinary ideas to diverse professional environments
- Improve their workplaces and communities, and the society through professional and personal activities
- be able to demonstrate competency and understanding of the basic concepts found in physics.
- be able to utilize the scientific method for formal investigation and to demonstrate competency with experimental methods that are used to discover and verify the concepts related to content knowledge.
- demonstrate skills necessary for conducting research related to content knowledge and laboratory skills.

Learning Outcomes:

- Upon completion, students will have:
- working knowledge of fundamental physics and basic electrical and/or mechanical engineering principles to include advanced knowledge in one or more engineering disciplines;
- the ability to identify, formulate, and solve engineering physics problems;
- the ability to apply the design process to engineering problems;
- the ability to formulate, conduct, analyze, and interpret experiments in engineering physics; and
- the ability to use modern engineering physics techniques and tools, including software and laboratory instrumentation.
- communicate their ideas effectively, both orally and in writing; and function effectively in multidisciplinary teams.
- an understanding of their professional and ethical responsibility to society;
- knowledge of the relationship between technology and society;
- a capacity and desire for life-long learning to improve themselves as citizens and engineers; and
- a knowledge of technical contemporary issues.

Course Contents:

Group - 1: Experiments from Higher Secondary knowledge of Physics
1. Determination of thermal conductivity of a good conductor by Searle's method.
2. Determination of thermal conductivity of a bad conductor by Lees and Chorlton's method.
3. Determination of dispersive power of the material of given prism.
4. Use of Carry Foster's bridge to determine unknown resistance.

Group -2: Experiments on General Properties of matter
5. Determination of Young's modulus by Flexure method and calculation of bending moment and shear force at a point on the beam.
6. Determination of modulus of rigidity by static/dynamic method.

Group -3: Optics
8. Determination of wavelength of light by Newton's ring method.
9. Determination of wavelength of light by Fresnel's bi-prism method.
10. Determination of wavelength of light by Laser diffraction method.

Text Book:

1. Basic Engineering Physics – Pal & Bhattacharya
2. B. Sc. Practical Physics

Lab Manuals

Object : To determine the specific resistance of a given wire with the help of Carey Foster's bridge.

Apparatus : Carey Foster's bridge, Laclanche cell, galvanometer, a rheostat of low resistance (or two one ohm coils), decimal resistance box, copper strips, a key, a resistance of known length.

Formula :

$$Y = X + \rho\,(l_1 - l_2)$$

where Y is the unknown resistance X is the known resistance (from resistance box), ρ is the resistance per unit length of bridge wire and l_1 and l_2 are the balancing lengths from left side when resistance box is in left side and right side respectively.

(*i*) When Y = 0 (copper strip) and $X = R_1$ (from resistance box)

$$\rho = \frac{R_1}{(l_2 - l_1)}$$

(*ii*) When Y = resistance of unknown resistance wire and X = R (from resistance box), the respective balancing lengths are l_3 and l_4,

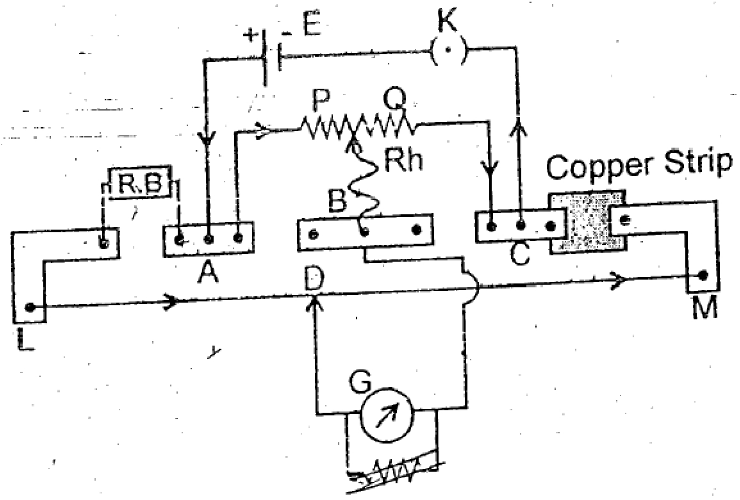
$$\therefore \quad Y = R + \rho\,(l_3 - l_4)$$

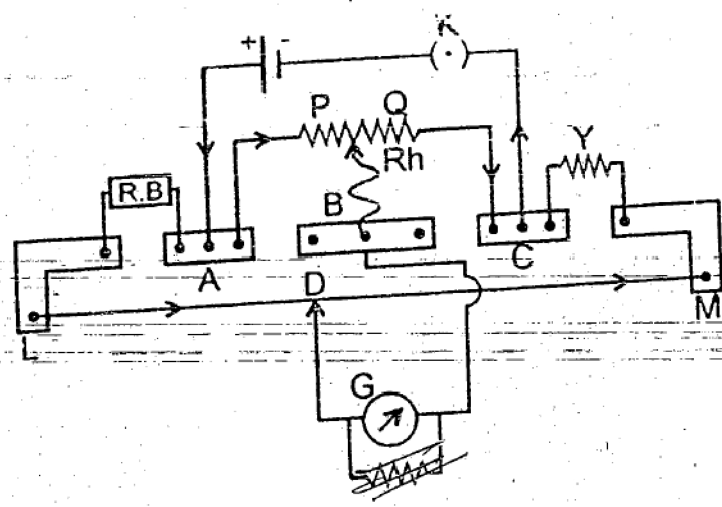
$$Y = R + \frac{(l_3 - l_4)\,R_1}{(l_2 - l_1)}$$

The Specific Resistance of a wire

$$K = Y\,\frac{\pi r^2}{l}$$

where r and l are the radius and length of a resistance wire



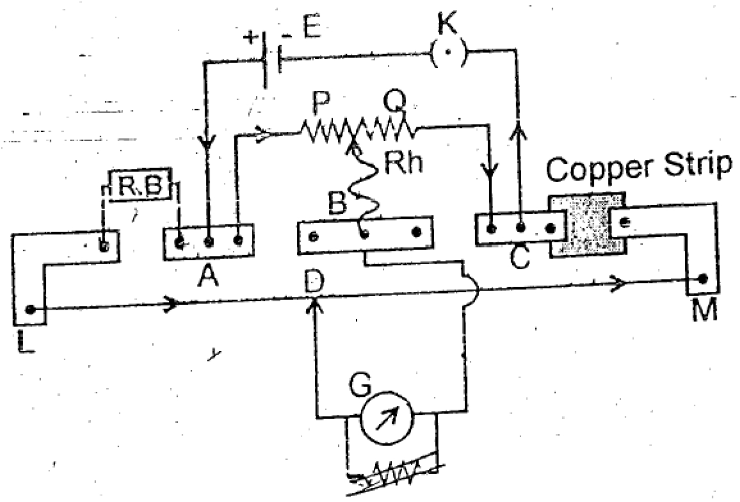


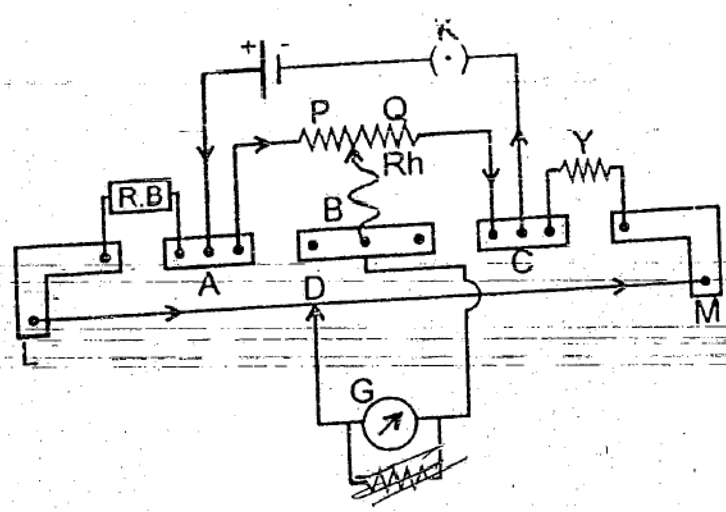
Observations :

(A) Determination of ρ :

S. No.	Resistance introduced in R.B. R_1 ohm	Position of null point when resistance R_1 is in left gap l_1 cm	in right gap l_2 cm	$(l_2 - l_1)$ cm	$\rho = \frac{R_1}{(l_2 - l_1)}$ ohm/cm
1					
2					
3					
4					

Mean ρ = ... ohm/cm.





Observations :

(A) Determination of ρ :

S. No.	Resistance introduced in R.B. R_1 ohm	Position of null point when resistance R_1 is		$(l_2 - l_1)$ cm	$\rho = \frac{R_1}{(l_2 - l_1)}$ ohm/cm
		in left gap l_1 cm	in right gap l_2 cm		
1					
2					
3					
4					

Mean ρ = ... ohm/cm.

(B) Determination of resistance Y :

S. No.	Resistance introduced in R.B. R ohm	Position of null point when resistance R is		$(l_3 - l_4)$ cm	$Y = R + \rho\,(l_3 - l_4)$ ohm
		in left gap l_3 cm	in right gap l_4 cm		
1					
2					
3					
4					

Mean Y = ... ohm

(C) Length of wire l =.......... cm.

(D) Determination of radius of wire :

Pitch of the screw gauge =.........., cm.

Least count of screw gauge =.......... cm.

S. No.	Diameter of wire in		Mean diameter
	one direction	perpendicular direction	
1			
2			
3			

Mean diameter =.......... cm.

Mean radius r =.......... cm.

Calculations :

(*a*) ρ =..........ohm/cm (*b*) Y =..........ohm

(*c*) l =..........cm (*d*) r =..........cm.

$$K = \frac{Y\pi r^2}{l}$$

= ....

Result :

Specific resistance of the material of a wire

K = ... ohm-cm.

Standard value

Manganin K = 42×10^{-6} ohm-cm.

Nichrome K = 103×10^{-6} ohm-cm.

Dispersive Power of Prism

Experiment No.

Object : *To determine the dispersive power of the material of a prism by spectrometer.*

Apparatus : Spectrometer, prism, spirit level, reading lens and mercury lamp.

Formula : The dispersive power of the material of a prism is given by

$$\omega = \frac{\mu_v - \mu_R}{(\mu_Y - 1))}$$

Where $\mu_V =$ Refractive index of the material of a prism for extreme violet colour

$\mu_R =$ Refractive index of the material of a prism for extreme red colour

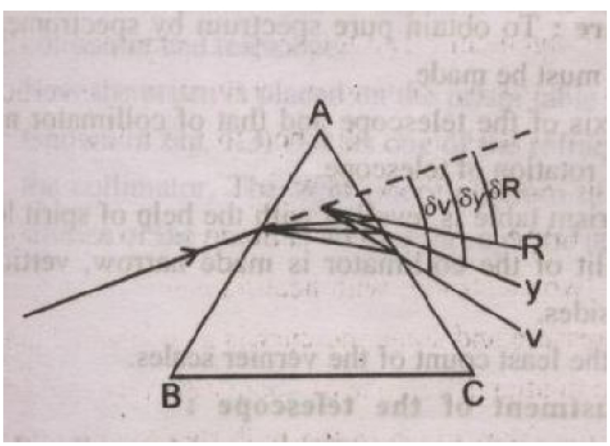
$\mu_Y =$ Refractive index of the material of a prism for yellow (mean) colour position.

Refractive index is given by

$$\mu = \frac{\sin(A+\delta_m)/2}{\sin(A/2)}$$

Where A = Angle of prism

δ_m = Angle of minimum deviation



Procedure : To obtain pure spectrum by spectrometer the following adjustments must be made :

- The axis of the telescope and that of collimator msut intersect the central axis of rotation of telescope.

- The prism table is leveled with the help of spirit level.
- The slit of the collimator is made narrow, vertical and symmetrical on both sides.
- Note the lest count of vernier scales.
- **Adjustment of the telescope.**
  - i) Turn the telescope towards a white wall and the distance between its objective and the eyepiece is so adjusted that the field of view becomes completely luminous. Now the eyepiece is displaced inside the tube till the cross-wire becomes distinctly visible.
  - ii) Now the telescope with objective is directed towards a distant tree or pole and they are viewed through the telescope. The distance between the objective and the eye piece is adjusted with the help of rack and pinion arrangement such that a distinct and clear image of the object is seen. Thus the telescope is ready to focus all the parallel rays at the cross wire.
- **Adjustment of Collimator :** Place the mercury lamp in front of the slit of collimator and align the telescope with the collimator such that the image of the slit is seen through telescope. Thej distance between the slit and the lens of the collimator is adjusted with the help of its rack and pinion arrangement until a distinct image is seen through the telescope. In this position the light rays coming out of the collimator will be parallel to each other.
- **Adjustment of Prism table :** The height of the prism table is adjusted in such a way that the light rays coming out of the collimator fall maximum on the refracting surface of the prism when it is placed on the prism table.

  Schuster's method : There is another method of adjusting the telescope and the collimator for parallel rays. This method is called Schuster's method. The method is as follows :

  - i) First of all prism table is adjusted at the same height of the collimator and telescope.
  - ii) Now the prism is placed on the prism table in such a position that its one of the refracting surface faces the collimator. The light emerging from the other refracting surface of the prism is viewed through the telescope.
  - iii) The prism table and the telescope both are then rotated slowly and simultaneously so that the spectral lines always remain the cross-wire. A state is reached when on rotating the prism table further, the direction of rotation of the spectral lines reserved. This position is the position of minimum deviation.
  - iv) Now, keeping the telescope fixed, the prism table is rotated through a small angle. The spectral lines are seen to be blurred. The telescope is adjusted with the help of rack and pinion arrangement so that spectral lines become distinct and clear.
  - v) table is rotated through a small angle in the collimator is adjusted with the help of a rack and pinion arrangement so that spectral lines become distinct and clear.

vi) The method described in steps (iv) and (v) are repeated attain and again till the spectral lines become distinct and clear through out the entire rotation of the telescope.

In this position the spectrometer will be set for parallel rays coming out of the collimator, focusing parallel rays by telescope at its cross=-wire and the prism in the position of angle of minimum deviation.

- **Measurement of the angle of minimum deviation :**

i) Follow the procedure as given in steps (i), (ii), and (iii) of the Schuster's method.

ii) Now fix the vertical cross-wire on one of the extreme spectral line of the spectrum with the help of tangent screw of the telescope. Note the reading of both the verniers on the main scale.

iii) Similarly fix the vertical cross wire on the mean line (yellow line) and extreme spectral line on the other end of the spectrum and in each position note the reading of both the verniers on the main scale.

iv) The position of the prism table is kept fixed and the prism is removed. The telescope is rotated till the direct image of the slit is viewed at its vertical cross-wire. The position of the telescope is noted by the reading of both the verniers.

v) The difference of readings in steps (ii), (iii) with (iv) is calculated for both the circular verniers. The mean of these two differences will be angle of minimum deviation.

- **Measurement of the angle of Prism A :**

i) Place the prism on the prism table with its angle of prism A towards the collimator and with its refracting edge A at its centre. In this position some of the light falling on each refracting surface AB and AC will be reflected and can be received by the telescope.

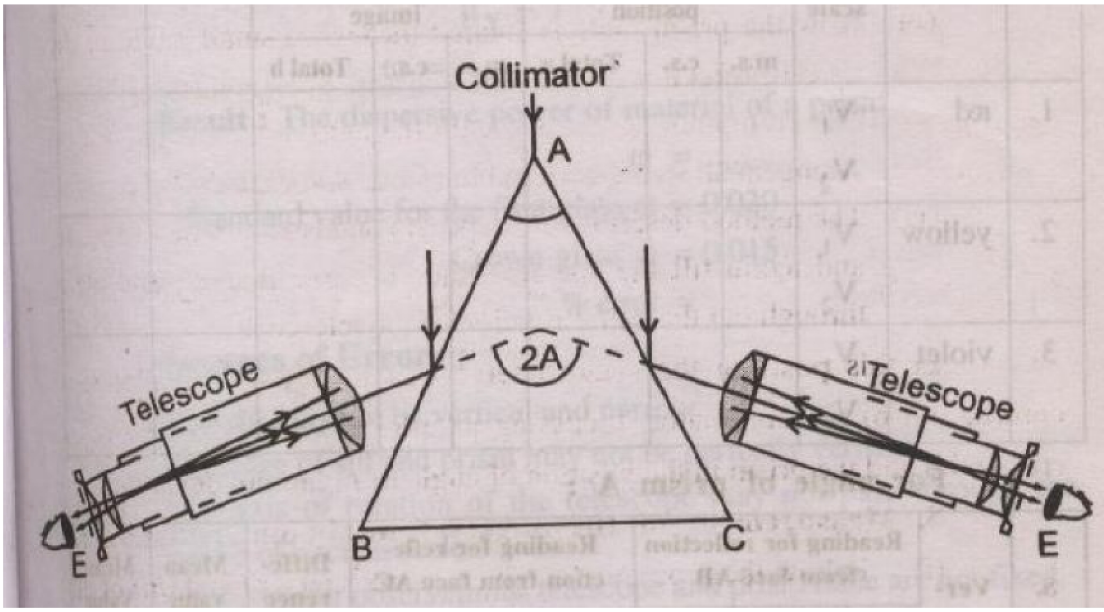
ii) The telescope is moved to one side to receive the light reflected from the refracting surface AB and the image of the slit is focused at the vertical cross-wire. The reading of two verniers are noted on the main scale.

iii) Now the telescope is moved to another side to receive the light reflected from the refracting surface AD and the image of slit is focused again at the vertical cross-wire. The reading of two verniers are noted again on the main scale.

iv) The difference of readings in steps (ii) and (iii) is calculated for both the verniers. The mean of these two differences will be twice the angle of prism. Therefore, half of this angle gives the angle of prism.

- The refractive index and then dispersive power of the prism are calculated from these observations.

Figure:



Observations :

One division of main scale x = ………………..

Number of vernier divisions n = ………………..

Least count of the vernier $\frac{x}{n}$ = ………………..

For minimum deviation δ_m :

S.No.	Colour	Circular Scale	Reading in the minimum deviation position			Reading in the position of direct image			δ_m = a b	Mean δ_m
			m.s.	c.s.	Total a	m.s.	c.s.	Total b		
1.	Red	V_1								
		V_2								
2.	Yellow	V_1								
		V_2								
3.	Violet	V_1								
		V_2								

For Angle of Prism A :

S.No.	Vernier	Reading for Reflection from face AB			Reading for reflection from fact AC			Diffe-rence a - b	Mean Value 2A	Mean Value A
		m.s.	c.s.	Total a	m.s.	c.s.	Total a			
1.	V_1									
	V_2									
2.	V_1									
	V_2									

Calculation :

Angle of prism A =

Angle of minimum deviation for extreme violet colour δ_V =

μ for violet $= \dfrac{\sin(A+\delta_m)/2}{\sin A/2}$

μ_V =

Angle of minimum deviation for extreme red colour δ_R =

μ for Red $= \dfrac{\sin(A+\delta_m)/2}{\sin A/2}$

μ_R =

Angle of minimum deviation for extreme red colour δ_Y =

μ for Yellow $= \dfrac{\sin(A+\delta_m)/2}{\sin A/2}$

μ_Y =

Dispersive power of material of a prism

$$\omega = \frac{\mu_V - \mu_R}{\mu_Y - a}$$

ϖ =

Result :

The dispersive power of material of a prism =

ω =

Standard value for the flint glass ω =

Crown Glass ω =

% error =

Sources of Error :

- The slit may not be vertical and narrow.
- The edge of slit and prism may not be perfectly vertical.
- The axis of rotation of the telescope may not pass through the centre of circular scale.
- While taking observations, telescope and prism table are not fixed.

- Prism is not clean.

Precautions :

- The slit should be as narrow as possible but the knife edge s of the slit should not touch each other.
- The telescope and the collimator should be separately set for parallel rays.
- The height of the prism table should be so adjusted that the maximum light must fall on the entire surface of the prism.
- While taking observations the telescope and the prism table must be clamped.
- The reading lens should be used for taking readings on both the verniers.

Viva-Voce :

- **What is the use of collilmator in the spectrometer?**
  The collimator makes the light rays coming from the light source parallel to each other.

- **Why are lines and circles drawn on the prism table?**
  For placing the grating or prism properly on the prism table.

- **Why do you take readings from both the verniers?**
  This is done in order to eliminate the error arising due to non coincidence of the axis of rotation of the prism table or the telescope with the centre of the circular main scale.

- Prism is not clean.

Precautions :

- The slit should be as narrow as possible but the knife edge s of the slit should not touch each other.
- The telescope and the collimator should be separately set for parallel rays.
- The height of the prism table should be so adjusted that the maximum light must fall on the entire surface of the prism.
- While taking observations the telescope and the prism table must be clamped.
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Viva-Voce :

- **What is the use of collilmator in the spectrometer?**
  The collimator makes the light rays coming from the light source parallel to each other.

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  This is done in order to eliminate the error arising due to non coincidence of the axis of rotation of the prism table or the telescope with the centre of the circular main scale.

Aim : To determination of wavelength of laser source.

Apparatus Required : A laser source, laser grating, screen, scale etc.

Formula : The wavelength of the laser source is

$$\lambda = \frac{x_m}{NM\sqrt{x_m^{\ 2} + D^2}} \ \overset{0}{A}$$

X_m = The mean distance of m^{th} order spot on either side of h central spot in meter.

D – distance between the grating and screen in meter.

N – Number of lines per Centimeter on the gating.

M – Order of diffraction spot.

OBS No.	Distance b/w the grating stand & screen (cm)	diffraction order	Distance of the n^{th} order spot from the central spot			Mean value (cm)	Wave length λ (cm)

Calculation : $N = \frac{Total\ No\ Lines}{2.54}$

$(a+b)\sin\theta = n\lambda$

For the 1st order maxima.

$$Sin\theta_1 = \frac{x}{\sqrt{x^2 + D^2}}$$

For the 2nd order maxima

$$Sin\theta_2 = \frac{x}{\sqrt{x^2 + D^2}}$$

$$\lambda_1 = \frac{Sin\theta}{nN}$$

$$\lambda_2 = \frac{Sin\theta_2}{nN}$$

$$\lambda = \frac{\lambda_1 + \lambda_2}{2}$$

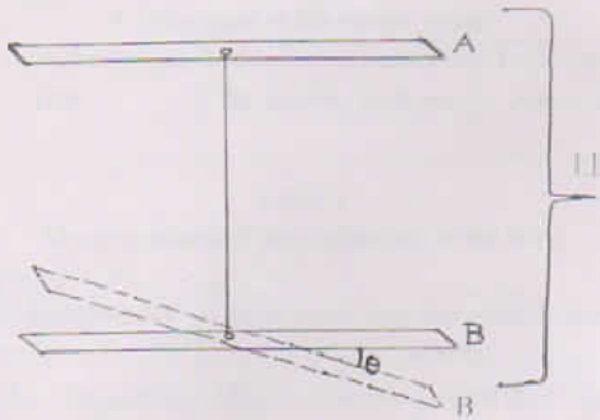
Result : The wavelength of the laser is .... $\overset{0}{A}$

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Lab Manual

Title: To determine the modulus of rigidity of the material of a wire by dynamic method

Date: 05.09.2012



LHS page of notebook

Fig. 1. Schematic diagram of the experimental set up

Aim:

Measurement of the modulus of rigidity of the material of a wire by dynamic method

Theory:

Torsional pendulum consists of a metal wire clamped between two identical bars A and B as shown in Fig. 1. The wire passes through the centre of gravity of the bars. The bar A is fixed horizontally and the torque is applied at the other bar, B to twist the wire. The bar B is twisted by an angle θ and is released. The bar is twisted, which in turn twists the wire and hence elements in the wire under shearing strain. The restoring couple of the wire tries to bring the wire back to the original position. So the bar B will execute oscillations about the vertical axis. The twisting couple per unit twist on the wire is $C = \eta\pi r^4/2l$, where l and r are the length and radius of the wire. If L, b and M are the length, breadth and mass and of the bar B respectively, then the moment of inertia I of the bar B about its axis of suspension is given by,

$$I = \frac{M(L^2 + b^2)}{12} \qquad \text{.....(i)}$$

The modulus of rigidity of the material of the wire is given by,

$$\eta = \frac{8\pi I l}{T^2 r^4} \qquad \text{......(ii)}$$

where, T is the time period of oscillation of the bar B.

Apparatus:

Two bars, suspension wire, stop watch, screw gauge, vernier callipers and meter scale.

Experimental Data:

Table 1

Least count of the screw gauge

Pitch of the screw (p) (cm)	No of division on the circular scale (n)	Least count p/n (cm)

Table 2

Measurements of the radius (r) of the wire

Error of the screw gauge ......cm

Serial No	Reading along any diameter (a) (cm)				Reading along perpendicular diameter (b) (cm)				Mean Diameter D = (a+b)/2 (cm)	Radius (r) (cm)
	Main Scale	Circular scale	Total	Corrected value of "a"	Main Scale	Circular scale	Total	Corrected value of "b"		
1										
2										
3										

Table 3

Measurements of the length (l) of the wire

Serial No	Effective length (l) of the wire between the clamps (cm)	Mean l (cm)
1		
2		
3		

Table 4

Vernier constant of slide callipers

m divisions of vernier = n divisions of main scale

Value of 1 smallest main scale division (l_1) (cm)	Value of 1 vernier division $(l_2 = \frac{n}{m} l_1)$ (cm)	Vernier constant v.c = $(l_1 - l_2)$ (cm)

Table 5

Measurements of the breadth (b) of the bar

Serial No	Reading of the b			Mean b (cm)	Instrumental error (cm)	Correct b (cm)
	Main (cm)	Vernier	Total (cm)			
1						
2						
3						

Table 6

Measurements of the length (L) of the bar, B

Serial No	Length (L) of the bar B (cm)	Mean L (cm)
1		
2		
3		

Table 7

Moment of Inertia of bar B about the axis of suspension

Mass (M) (gm)	Length (L) (cm)	Breadth (b) (cm)	$I = \frac{M(L^2+b^2)}{12}$ (gm-cm^2)

Table 6

Measurements of time period of oscillation, T

Least count of the stop-watch ...... secs.

Serial No	Time for 10 oscillations (sec)	Time period, T (sec)
1		
2		
3		

Calculations: (LHS page of your note book)

I= .... gm-cm^2

l= .... cm

T= .... sec

r= ...... cm

Therefore,

$$\eta = \frac{8\pi I l}{T^2 r^4}$$

Result: The modulus of rigidity of the material of the given wire, obtained by dynamic method is ..... dyne/cm^2.

Percentage Error:

$$\eta = \frac{8\pi I l}{T^2 r^4}$$

or by putting the value of I, the expression for n becomes

$$\eta = \frac{8\pi M(L^2+b^2)l}{12T^2r^4}$$

Since the measured quantities are L, b, l, T and r, therefore the maximum proportional error in η is

$$\frac{\delta\eta}{\eta} = \frac{(2\delta L + 2\delta b)}{(L^2 + b^2)} + \frac{\delta l}{l} + \frac{2\delta T}{T} + \frac{4\delta r}{r}$$

The maximum percentage error in determining η is $\frac{\delta\eta}{\eta} \times 100 =$ ......%

Precautions and discussions:

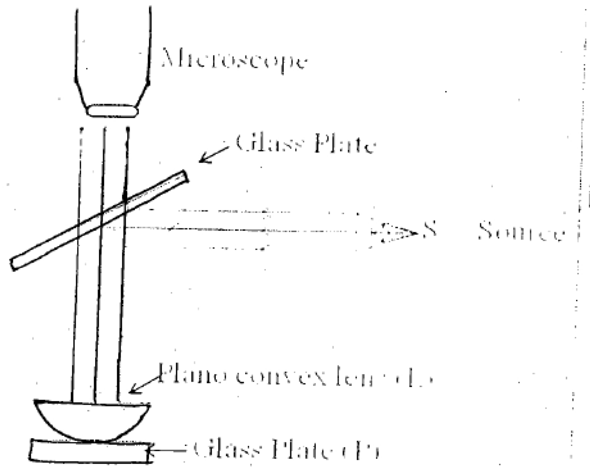
(i) The amplitude of oscillations must be kept very small so that the motion is truly simple harmonic.

(ii) As the radius comes in fourth order in the expression of n, so it should be measured very carefully.

(iii) The bar should oscillate in horizontal plane.

Title: To determine the wavelength of light by Newton's ring method

Date:



LHS page of notebook

Schematic diagram of the experimental set up

Aim:

Measurement of the wavelength of light by Newton's ring method.

Theory:

When a parallel beam of monchromatic light is incident normally on a combination of a plano-convex lens L and a glass plate P, as shown in the schematic diagram, a part of each incident ray is reflected from the lower surface of the lens, and a part after refraction through the air film between the lens and the plate, is reflected back from the plate surface. These two reflected rays are coherent. Hence the reflected rays will interfere and produce a system of alternate dark and bright rings with the point of contact between the lens and the plate as the centre. These rings are known as Newton's rings.

If D_m is the diameter of the mth bright ring, counted from the centre, we have

$$\frac{D_m^2}{4R} = (2m+1)\frac{\lambda}{2} \qquad \text{(i)}$$

where R is the radius of curvature of the lower surface of the lens L, and λ is the wavelength of the light.

For the (m+n)th bright ring from the centre, we obtain

$$\frac{D_{m+n}^2}{4R} = (2m+2n+1)\frac{\lambda}{2} \qquad \text{(ii)}$$

Where D_{m+n} is the diameter of (m+n)th ring.

From (i) and (ii) we get $$\lambda = \frac{D_{m+n}^2 - D_m^2}{4nR} \qquad \text{(iii)}$$

Equation (iii) is used as the working formula for calculating the wavelength (λ) of light.

Apparatus:

Travelling microscope. Plano convex lens. Plain glass plate (optically flat). Reflector. Sodium light source

Experimental Data:

Table 1

Vernier constant for the horizontal scale of the microscope

m divisions of vernier = n divisions of main scale

Value of 1 smallest main scale division (l_1) (cm)	Value of 1 vernier division $(l_2 = \frac{n}{m} l_1)$ (cm)	Vernier constant v.c $(l_1 - l_2)$ (cm)

Table 2

Measurements of the diameters of the rings

Ring No (m)	Microscope readings (cm) on the						Diameter D_m = L-R (cm)	D_m^2 (cm^2)
	Left (L)			Right (R)				
	Main	Vernier	Total	Main	Vernier	Total		
30								
25								
20								
15								
10								
5								

Graph: A graph is plotted with square of the ring diameter (D_m^2) against the ring number.

Calculations: (LHS page of your note book)

Value of D_m^2 from graph ..... cm^2

Value of D_{m+n}^2 from graph = ... cm^2

Value of n ....

Value of R ...... cm.

Therefore,

$$\lambda = \frac{D_{m+n}^2 - D_m^2}{4nR} \quad A^o$$

Result: The wavelength of the light is ....

Percentage Error:

$$\lambda = \frac{D_{m+n}^2 - D_m^2}{4nR}$$

Since D_{m+n} and D_m are only measured, the maximum proportional error in λ is

$$\frac{\delta\lambda}{\lambda} = \frac{\delta(D_{m+n}^2 - D_m^2)}{D_{m+n}^2 - D_m^2}$$

$= 8x$ v.c / measured values of $(D_{m+n}^2 - D_m^2)$

The maximum percentage error in determining λ is $\frac{\delta\lambda}{\lambda} \times 100$ = ...%

Precautions and discussions:

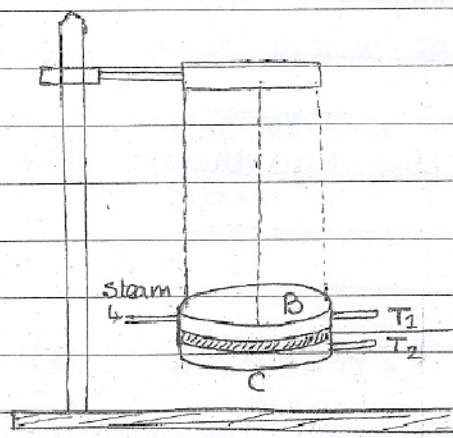
1. The glass plate and the lens should be very clean before setting up the apparatus.
2. The lens used should be of large radius of curvature.
3. The source of light should be an extended one.
4. Crosswire should be focused on the ring tangentially.
5. Care must be taken not to disturb the lens and glass plate combination in any way during the experiment.

Title of the experiment:

To determine the thermal conductivity of a bad conductor in the form of a disc by the Lees and Charlton method.

Date: 5-11-2012

Aim: Determination of the thermal conductivity of a bad conductor in the form of a disc by Lees & Charlton's method.



Schematic diagram of the experimental set up

Theory:

Let θ_1 & θ_2 be the steady state temperature recorded by the thermometers T_1 & T_2 respectively. If d is the thickness & A is the cross-sectional area of the disc S, then the quantity of heat Q conducted through the disc per second is given by,

$$Q = \frac{KA(\theta_1 - \theta_2)}{d}$$

where K is the thermal conductivity of the material of the disc S

Thus, $K = \frac{Qd}{A(\theta_1 - \theta_2)}$.

If m is the mass, s is the specific heat & $\frac{d\theta}{dt}$ is the rate of cooling at θ_2, of the slab C, then

$$Q = ms \left.\frac{d\theta}{dt}\right|_{\theta_2}.$$

$$\therefore K = ms \left.\frac{d\theta}{dt}\right|_{\theta_2} \frac{d}{A(\theta_1 - \theta_2)}.$$

This is the working formulae of the experiment.

Apparatus:

Two metal slabs, experimental disc, two thermometers.

Experimental data:

Specific heat of the slab C is, (s) = 0.48 cal/gm/°C)

Mass (m) of the slab C is = 788 gm.

Table 1:

Vernier constant of slide Callipense.

.... divisions of vernier scale = ... division of main scale.

Value of 1 smallest division in main scale (cm)	Value of 1 vernier division (cm)	vernier constant (cm)

Table 2:

Cross-sectional area (A) of the ~~slab~~ disc, S.

Main Scale Reading (cm)	Vernier Reading	Total Reading (cm)	Mean Reading d' (cm)	$A = \frac{\pi d'^2}{4}$ (cm^2)
----	---	---	----	---
----	---	---		

Table 3:

Least count of screw-gauge

Pitch of the screw (cm)	No of divisions in circular scale	~~instrumental error~~ Least count (cm)

Table 4:

Determination of thickness(d) of disc, S.

Main Scale reading (cm)	Circular Scale reading	Total reading (cm)	Error, if any (cm)	Corrected reading d (cm)	Mean d.
------	---	-----	----	----	----
----	----	----		----	

Table 5:

Determination of initial errors of thermometers T_1 & T_2

initial readings of thermometer (°C) T_1	T_2	Correction to be added (°C)
----	----	---

Table 6 :

Temperature of B & C with time & values of θ_1 & θ_2

time in minute	0	5	10	15	20	25	30	35	40
Temperature of B	..	..	...	...	...	...	θ_1	θ_1	θ_1
Temperature of C	..	..	..	..	..	..	θ_2	θ_2	θ_2

Table 7:

Record of temperature of slab C with time during cooling

Time (min)	0	$\frac{1}{2}$	1	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3	$3\frac{1}{2}$	etc
Temperature of C (°C)	(θ') ...	...	...	...	...	...	...	...	etc (θ'')

Graph :

A graph is drawn by plotting time (in min) along x-axis & θ (in °C) along y-axis. From graph, find $\frac{d\theta}{dt}$ at θ_2.

Table 8 :

Computation of K.

DATE

m (given) (in gm)	s (given) (cal/°c/gm)	d (in cm)	A (in cm²)	$\theta_1 - \theta_2$ (°c) (from table 6)	$\frac{d\theta}{dt}/_{\theta_2}$ (°c/s)	K (cal/cm/°c/s)
---	---	---	---	---	---	--

Result:

The conductivity of the material of the given disc is .... cal/cm/°c/sec.

Percentage Error:

$$K = \frac{m s d \left(\frac{d\theta}{dt}\right)_{\theta_2}}{A(\theta_1 - \theta_2)}$$

$$= \frac{4 m s d \left(\frac{d\theta}{dt}\right)_{\theta_2}}{\pi d'^2 (\theta_1 - \theta_2)}$$

$$\therefore \frac{\delta K}{K} = \frac{\delta d}{d} + \frac{\delta(\theta' - \theta'')}{\theta' - \theta''} + \frac{\delta t}{t} + \frac{2\delta d'}{d'} + \frac{\delta(\theta_1 - \theta_2)}{\theta_1 - \theta_2}.$$

$\therefore$ percentage error $= \frac{\delta K}{K} \times 100\%$.

Discussions:

i) Ensure that the steam chamber & the system is horizontal.

ii) Ensure that the maximum temperature of B & C below the upper limit of thermometer by 5°c.

iii) The loss of heat from the side surface of the disc S is neglected as it is taken very thin.

Title: To determine Young's modulus of the material of the bar by Flexure method

Date:

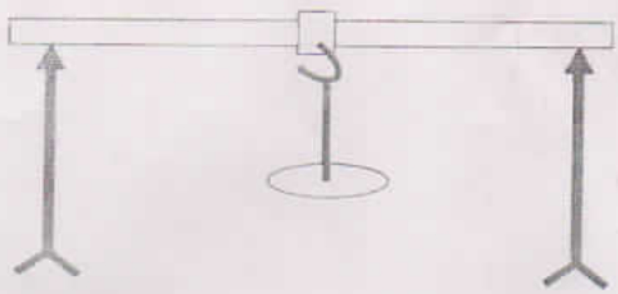


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Fig. 1. Schematic diagram of the experimental set up

Aim:

Measurement of the Young's modulus of the material of the bar by Flexure method.

Theory:

If a light bar of breadth b and depth d is placed horizontally on two knife-edges separated by a distance L, and a load of mass m, applied at the midpoint of the bar, produced a depression l of the bar, then Young's modulus Y of the material of the bar is give by,

$$Y = \frac{gL^3}{4bd^3} \cdot \frac{m}{l} \qquad \ldots(i)$$

Where g is the acceleration due to gravity. This is the working formula of the experiment.

Apparatus:

Rectangular light bar, two knife edges, light frame with a pointer, hanger, weights, spherometer and a meter scale.

Experimental Data:

Table 1

Least count of the spherometer

Value of 1 smallest linear scale division (p) (cm)	No of division on the circular scale (N)	Least count p/N (cm)

Table 2

Load-depression data for length L

Distance between two knife edges = ... cm

No of Obs	Load m (kg)	Reading for increasing load (cm)			Reading for decreasing load (cm)			Mean reading $(a+b)/2$ (cm)	Depression (l) (cm)
		Main Scale	Circular scale	Total (a)	Main Scale	Circular scale	Total (b)		
1	0								
....	0.5								
....	...								

Table 3

Vernier constant of slide callipers

m divisions of vernier = n divisions of main scale

Value of 1 smallest main scale division (l_1) (cm)	Value of 1 vernier division ($l_2 = \frac{n}{m} l_1$)(cm)	Vernier constant v.c = ($l_1 - l_2$) (cm)

Table 4

Measurements of the breadth (b) of the bar

Serial No	Reading of the b			Mean b (cm)	Instrumental error (cm)	Correct b (cm)
	Main (cm)	Vernier	Total (cm)			
1						
2						
3						

Table 5

Least count of the screw gauge

Pitch of the screw (p) (cm)	No of division on the circular scale (n)	Least count p/n (cm)

Table 6

Measurements of the depth of the bar (d)

Serial No	Reading d (cm)				Instrumental error (cm)	Correct d (cm)
	Main Scale	Circular scale	Total	Mean		
1						
2						
3						

Graph: A graph is plotted with m (in kg) along x-axis and depression l (in cm) along y-axis.

Calculations: (LHS page of your note book)

b = ... cm

d = ... cm

g= .... cm/sec^2

L = ... cm

m/l from graph = ... gm/cm

Therefore,

$$Y = \frac{gL^3}{4bd^3} \cdot \frac{m}{l} \text{ dyne/cm}^2$$

Result: The Young's modulus of the material of the given bar, obtained by Flexure method is ...... dyne/cm^2.

Percentage Error:

$$Y = \frac{gL^3}{4bd^3} \cdot \frac{m}{l}$$

The quantities L, b, d and l are measured in this experiment. The maximum proportional error in Y is given by

$$\frac{\delta Y}{Y} = 3\frac{\delta L}{L} + \frac{\delta b}{b} + 3\frac{\delta d}{d} + \frac{\delta l}{l}$$

The maximum percentage error in determining Y is $\frac{\delta Y}{Y} \times 100 =$ ......%

Precautions and discussions:

(i) In the expression of Y, both the length L between the knife-edges and the depth d of the bar occur in power of three. But as d is much smaller than L, much care should be taken to measure d to minimize the proportional error in Y.

(ii) Care should be taken to make the beam horizontal and to load the bar at its mid-point.

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR
Lab Manual

Title of Course: Basic Electrical & Electronics Engineering-I Lab
Course Code: ES191
L-T-P scheme: 0-0-3 **Course Credit: 2**

Basic Electronics Engineering-I Lab:
Objectives:
1. Impart understanding of working principles and applications of semiconductor devices in the design of electronic circuits.
2. Introduce basic applications like rectifiers, amplifiers and other signal conditioning circuits with emphasis on practical design considerations.
3. Provide basic understanding of digital circuits and principles of logic design.
4. To enhance the understanding of the topics in the curriculum, specific activities have been designed as conceptual and handsonaid.

Learning Outcomes: On successful completion of this course, the students will be able to:
1. Analyze and appreciate the working of electronic circuits involving applications of diodes and transistors.
2. Comprehend working of amplifiers.
3. Design simple analog circuits .
4. Develop simple projects based on the different devices studied in this course.

Course Contents:
Exercises that must be done in this course are listed below:
1.To determine the stated value of the color code theresistor
2. To determine the forward characteristics of a p-n junction diode and determine the static and dynamic resistance.
3. Study of Zener diode as a voltage regulator
4. Study of ripple characteristic of full wave rectifier
5. Study of characteristics curves of B.J.T

Text Book:
1.Melvin: Electronic Principle.
2. Schilling &Belove: Electronics Circuits.
3. Millman & Grabal: Microelectronics

Recommend component Requirements:
1. Resisters , Capacitors ,Transistors ,Inductors ,Bread board and jumper wires
2. Input Output Device Function Generator CRO Probes.
3. Power Supply Proper Requirement.

EXPERIMENT NO.-1

AIM: To determine the stated value of the color code theresistor

Apparatus
1. Set of wires.
2. Carbon Resistors.

3. Digital A.V.O. meter.

Theory

There are two ways to find the resistance value of a resistor. The color bands on the body of the resistor tell how much resistance it has. As shown in the following diagrams figure (1), there are 5-band resistors and 4-band resistors. Form both 5- and 4-band resistors, the last band indicates tolerance in table (1). Consult with the "Resistor Tolerance" in table (2) chart for finding the tolerance value.

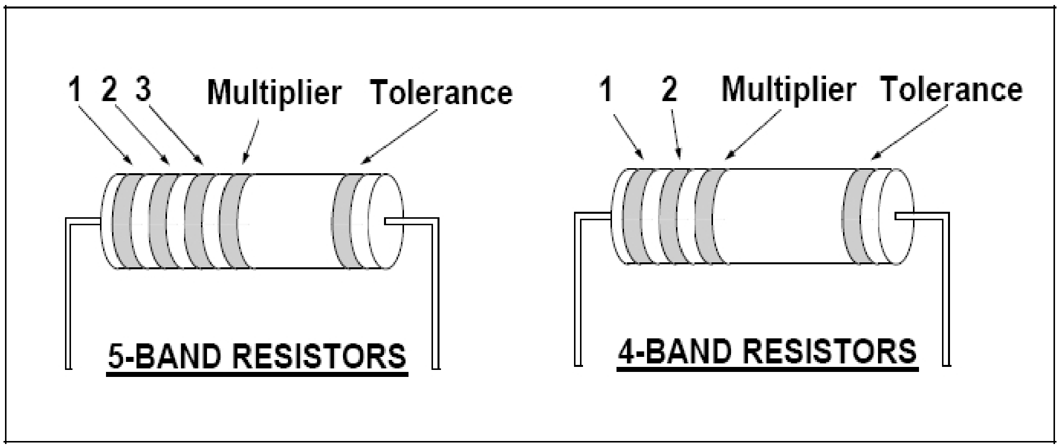
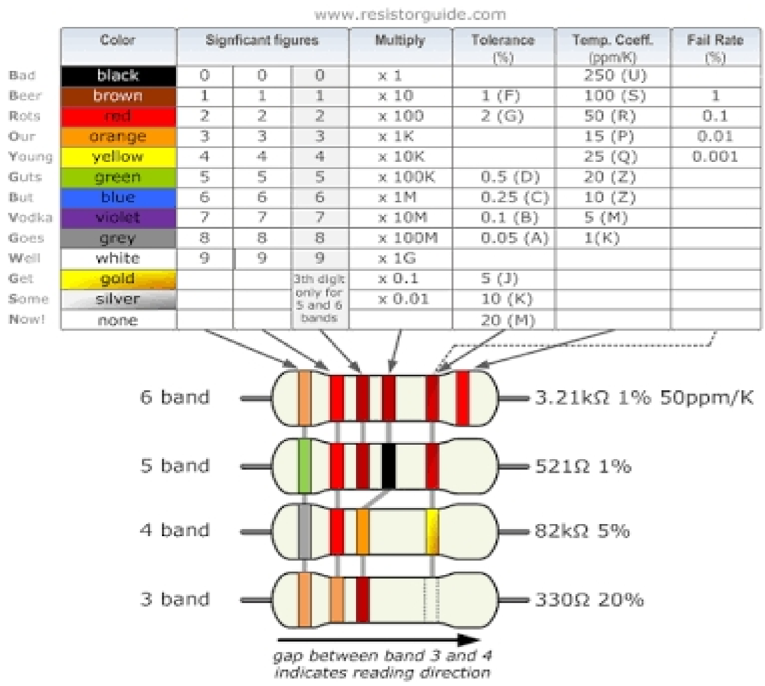


Fig.(1) 5- Band and 4- Band resistors

The first band is a one (1), the second band is a zero (0), and the multiplier band or third band is one time text to the third power ( ) or one thousand (1000). Multiply 10 times 1000.
Another way to tell the resistance value of a resistor is to actually measure it with the ohmmeter. The explanation of how to measure the resistance is given in the later tip.
Where:-

$$Rmax = R+(R * T)$$

$$Rmin = R+(R * T_D)C$$


www.resistorguide.com

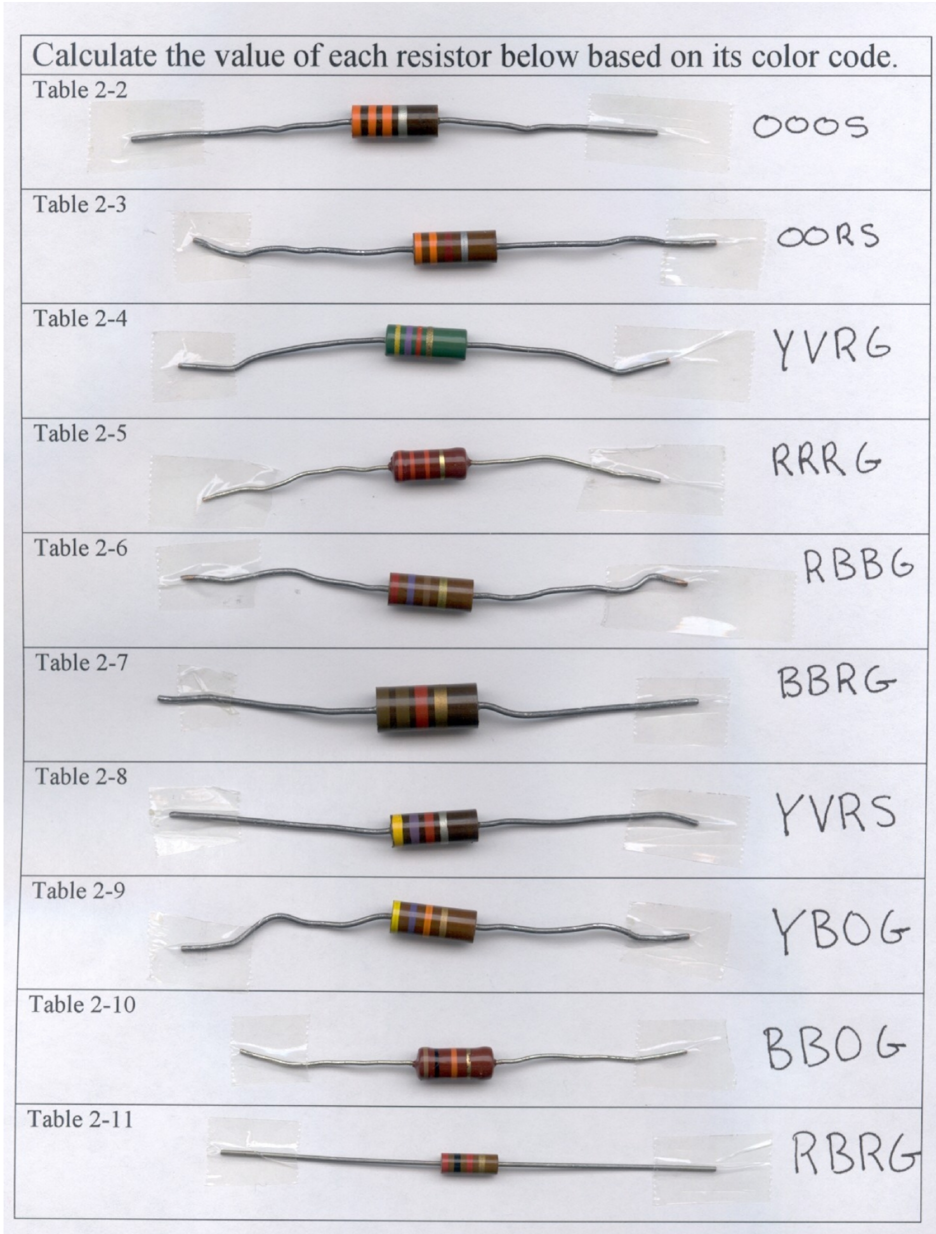
	Color	Signficant figures			Multiply	Tolerance (%)	Temp. Coeff. (ppm/K)	Fail Rate (%)
Bad	black	0	0	0	x 1		250 (U)	
Beer	brown	1	1	1	x 10	1 (F)	100 (S)	1
Rots	red	2	2	2	x 100	2 (G)	50 (R)	0.1
Our	orange	3	3	3	x 1K		15 (P)	0.01
Young	yellow	4	4	4	x 10K		25 (Q)	0.001
Guts	green	5	5	5	x 100K	0.5 (D)	20 (Z)	
But	blue	6	6	6	x 1M	0.25 (C)	10 (Z)	
Vodka	violet	7	7	7	x 10M	0.1 (B)	5 (M)	
Goes	grey	8	8	8	x 100M	0.05 (A)	1(K)	
Well	white	9	9	9	x 1G			
Get	gold			3th digit only for 5 and 6 bands	x 0.1	5 (J)		
Some	silver				x 0.01	10 (K)		
Now!	none					20 (M)		

COLOR	FIRST BAND	SECOND BAND	MULTIPLIER	TOLERANCE
BLACK		0	$10^0 = 1$	
BROWN	1	1	$10^1 = 10$	
RED	2	2	$10^2 = 100$	
ORANGE	3	3	$10^3 = 1000$	
YELLOW	4	4	$10^4 = 10000$	
GREEN	5	5	$10^5 = 100000$	
BLUE	6	6	$10^6 = 1000000$	
VIOLET	7	7	$10^7 = 10000000$	
GREY	8	8	$10^8 = 100000000$	
WHITE	9	9	$10^9 = 1000000000$	
GOLD			$10^{-1} = 0.1$	5%
SILVER			$10^{-2} = 0.01$	10%
NO COLOR				20%

Table 2-6		
Band	Color Code	Numeric Value
1st Band	Red	
2nd Band	Violet	
3rd Band	Brown	
4th Band	Gold	
The Resistor Value is_______________		The Tolerance is _______%

Table 2-7		
Band	Color Code	Numeric Value
1st Band	Brown	
2nd Band	Brown	
3rd Band	Red	
4th Band	Gold	
The Resistor Value is_______________		The Tolerance is _______%

Table 2-8		
Band	Color Code	Numeric Value
1st Band	Yellow	
2nd Band	Violet	
3rd Band	Red	
4th Band	Silver	
The Resistor Value is_______________		The Tolerance is _______%



Result;- Find the stated value of the color code theresistor

EXPERIMENT NO.-2

AIM

To determine the forward characteristics of a p-n junction diode and determine the static and dynamic resistance.

COMPONENTS AND EQUIPMENTS REQUIRED

SI No	NAME	SPECIFICATION	QUANTITY
1	POWER SUPPLY	0-30V	1 NO
2	VOLTMETER	0-20V	1 NO
3	AMMETER	0-100 mA	1 NO
4	DIODE	IN 4001-Si OR OA 79-Ge	1 NO
5	RESISTOR	1KΩ	1 NO
6	POTENTIOMETER	1KΩ	1 NO
7	BREAD BOARD		1NO
8	CONNECTING WIRES		AS REQUIRED

THEORY

When a P type and N type semiconductors are joined together, a junction diode is created .It has a unique ability to permit current only in one direction. The lead connected to P type is called anode and the lead connected to N type is called cathode.If the anode of the diode is connected to the +ve terminal of a battery and cathode to the –ve terminal,the set up is called forward bias.the diode does not pass any current till the battery voltage exceeds the potential barrier(o.7 V for Si & 0.3 V for Ge). Once the battery potential exceeds the barrier potential high forward current in the order of mA flows through the diode due to the movements of hole andelectrons.

The static resistance or DC resistance is the ratio of DC voltage across the diode to the DC current flows through it. Dynamic resistance or AC resistance of the diode at any point is the reciprocal of the slope of the charaecteristic at that point.

ie dynamic resistance= change in voltage/ change in current = $\Delta V/\Delta I$

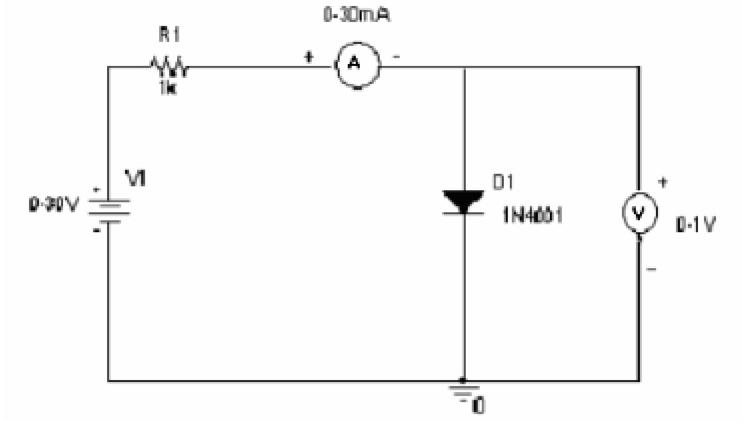
PROCEDURE

1. Set up the circuits as shown in figure on breadboard.
2. Switch on the powersupply
3. Varying the voltage across the diode in steps and find correspondingcurrent.

4. Repeat the above steps for different values ofvoltage

Circuit Diagram

Forward Bias



TABULATION:

V in volt	I in mA

RESULT

Plotted the forward characteristics of PN junction Si diode and its

Static resistance =…………….

Dynamic resistance =………….

EXPERIMENT-3

AIM: Study of Zener diode as a voltage regulator

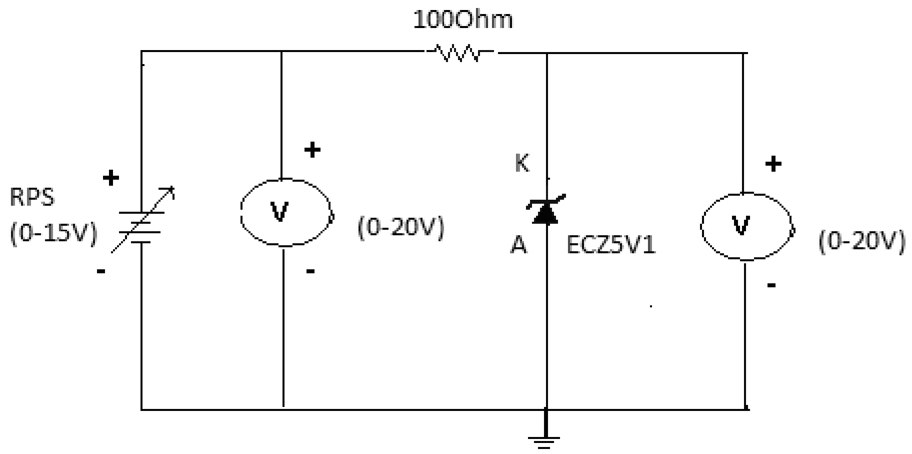
APPARATUS:
Zener diode – ECZ5V1, Regulated Power Supply (0-15V), Voltmeter, Ammeter, Resistor(1KΩ), Breadboard, Connecting wires

THEORY:
A zener diode is heavily doped p-n junction diode, specially made to operate in thebreak down region. A p-n junction diode normally does not conduct when reverse biased. Butif the

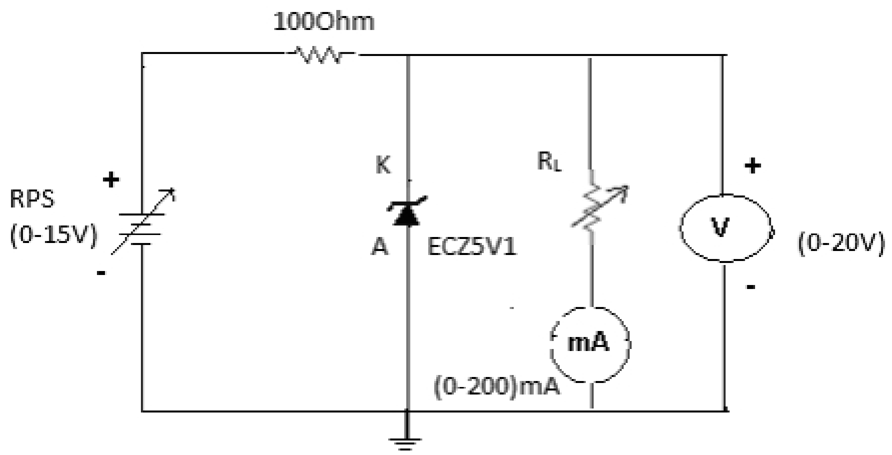
reverse bias is increased, at a particular voltage it starts conducting heavily. Thisvoltage is called Break down Voltage. High current through the diode can permanentlydamage the device. To avoid high current, we connect a resistor in series with zener diode.Once the diode starts conducting it maintains almost constant voltage across the terminalswhatever may be the current through it, i.e., it has very low dynamic resistance. It is used involtage regulators.

CIRCUIT DIAGRAM:

SUPPLY SIDE:



LOAD SIDE:



PROCEDURE:

SUPPLY SIDE:
1. Connections are made as per the circuit diagram.
2. The Regulated power supply voltage is increased in steps.
3. For different input voltages (V_i) corresponding output voltages (V_o) are observed and then noted in the tabular form.
4. A graph is plotted between input voltage (V_i) and the output voltage (V_o).

LOAD SIDE:

1. Connection are made as per the circuit diagram
2. The load is placed in full load condition and the output voltage (V_o), load current (I_L) are measured.
3. The above step is repeated by decreasing the value of the load in steps.
4. All the readings are tabulated and a graph is plotted between load current (I_L) and the output voltage (V_o).

OBSERVATIONS:
SUPPLY SIDE:-

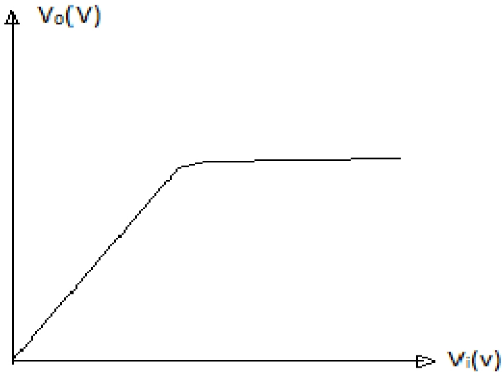
S.NO	V_i (V)	V_o (V)

LOAD SIDE:-

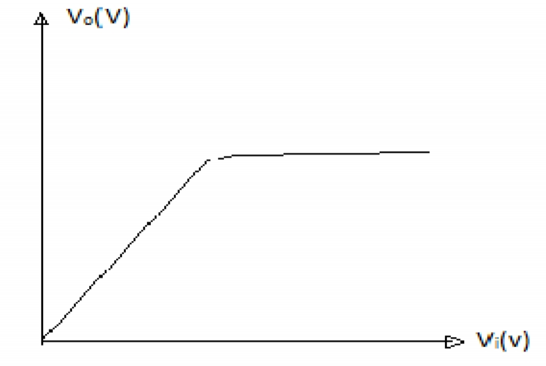
S.NO	I_L (V)	V_o(V)

MODEL GRAPH:

SUPPLY SIDE:



LOAD SIDE:



RESULT: Regulator characteristics of zener diode are obtained and graphs are plotted for load and supply side.

EXPERIMENT-4

AIM: Study of ripple characteristic of full wave rectifier.

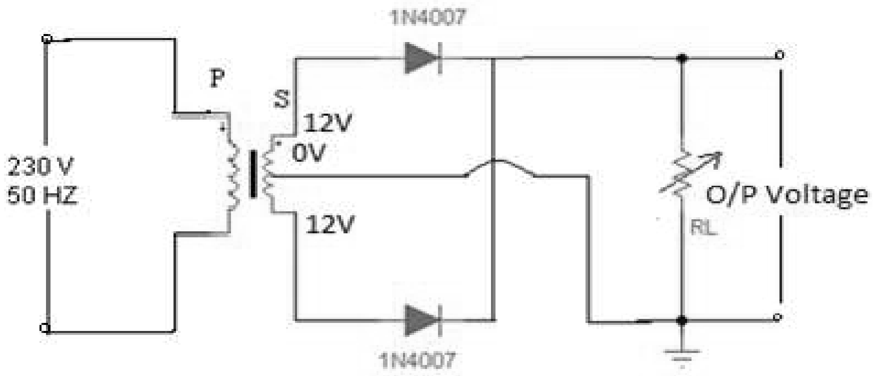
APPARATUS:
AC Supply (12V-0-12V), PN Diodes 1N4007, Connecting Wires, Variable resistor (0-10) KΩ, Breadboard, Multimeter

THEORY:

The circuit of a center-tapped full wave rectifier uses two diodes D1&D2. Duringpositive half cycle of secondary voltage (input voltage), the diode D1 is forward biased andD2is reverse biased. The diode D1 conducts and current flows through load resistor RL.During negative half cycle, diode D2 becomes forward biased and D1 reverse biased. Now,D2 conducts and current flows through the load resistor RL in the same direction. There is acontinuous current flow through the load resistor RL, during both the half cycles and will getunidirectional current as show in the model graph. The difference between full wave and halfwave rectification is that a full wave rectifier allows unidirectional (one way) current to theload during the entire 360 degrees of the input signal and half-wave rectifier allows this onlyduring one half cycle (180 degree).

CIRCUIT DIAGRAM:

WITHOUT FILTER



PROCEDURE:

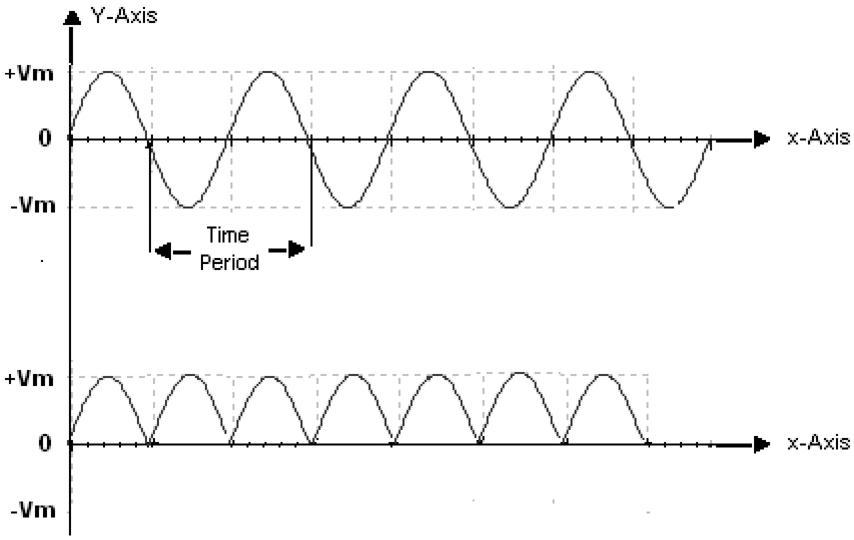
1. Connections are made as per the circuit diagram.
2. Connect the ac mains to the primary side of the transformer and the secondary side to the rectifier.
3. Measure the ac voltage at the input side of the rectifier.
4. Measure both ac and dc voltages at the output side the rectifier.
5. Find the theoretical value of the dc voltage by using the formula $V_{dc}=2V_m/\pi$
6. Connect the filter capacitor across the load resistor and measure the values of V_{ac} and V_{dc} at the output.
7. The theoretical values of Ripple factors with and without capacitor are calculated.
8. From the values of V_{ac} and V_{dc} practical values of Ripple factors are calculated. The practical values are compared with theoretical values.

OBSERVATIONS:

R_L(Ohms)	V_{ac}(Volts)	V_{dc}(Volts)	Ripple Factor = V_{ac}/ V_{dc}

MODEL GRAPHS:

FULLWAVE RECTIFIER:



RESULT:
The ripple factor of the Full-wave rectifier is calculated.

EXPERIMENT-5

AIM: Study of characteristics curves of B.J.T

APPARATUS:

NPN-Transistor (BC107), Regulated Power Supply (0-15V), Voltmeters (0-20V), Ammeters (0-200μA), (0-200mA), Resistors 1KΩ, Breadboard, Connecting wires, BJT

THEORY:

A transistor is a three terminal device. The terminals are emitter, base, collector. Incommon emitter configuration, input voltage is applied between base and emitter terminalsand output is taken across the collector and emitter terminals. Therefore the emitter terminalis common to both input and output.

The input characteristics resemble that of a forward biased diode curve. This isexpected since the Base-Emitter junction of the transistor is forward biased. As compared toCB arrangement I_B increases less rapidly with V_{BE}. Therefore input resistance of CE circuitis higher than that of CB circuit.

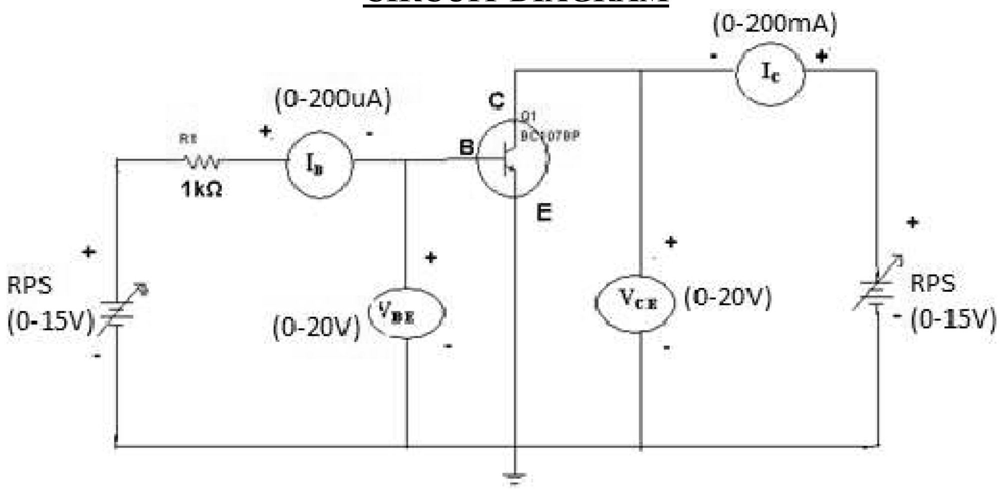
The output characteristics are drawn between Ic and V_{CE} at constant I_B. the collectorcurrent varies with V_{CE} unto few volts only. After this the collector current becomes almost constant, and independent of V_{CE}. The value of V_{CE} up to which the collector currentchanges with V_{CE}

is known as Knee voltage. The transistor always operated in the region above Knee voltage, I_C is always constant and is approximately equal to I_B.

The current amplification factor of CE configuration is given by

$$\beta = \Delta I_C / \Delta I_B$$

CIRCUIT DIAGRAM



PROCEDURE:

INPUT CHARECTERSTICS:

1. Connect the circuit as per the circuit diagram.
2. For plotting the input characteristics the output voltage V_{CE} is kept constant at 1Vand for different values of V_{BE}. Note down the values of I_C
3. Repeat the above step by keeping V_{CE} at 2V and 4V.
4. Tabulate all the readings.
5. Plot the graph between V_{BE} and I_B for constant V_{CE}

OUTPUT CHARACTERSTICS:

1. Connect the circuit as per the circuit diagram.
2. For plotting the output characteristics the input current I_B is kept constant at 10μAand for different values of V_{CE} note down the values of I_C
3. Repeat the above step by keeping I_B at 75 μA, 100 μA
4. Tabulate the all the readings
5. Plot the graph between V_{CE} and I_C for constant I_B.

OBSERVATIONS:

INPUT CHARACTERISTICS:

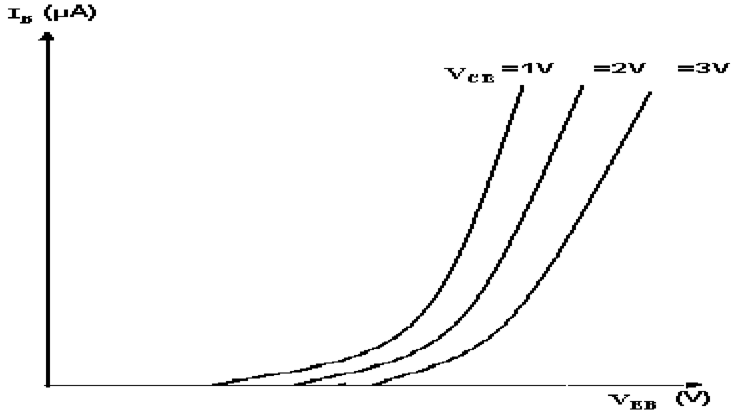
S.NO	V_{CE} = 1V		V_{CE} = 2V		V_{CE} = 4V	
	V_{BE}(V)	I_B(μA)	V_{BE}(V)	I_B(μA)	V_{BE}(V)	I_B(μA)

OUTPUT CHARACTERISTICS:

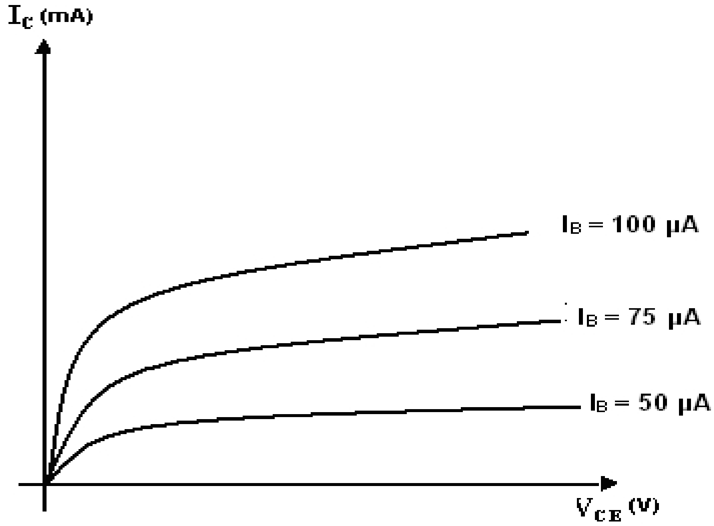
	I_B = 50 μA		I_B = 75 μA		I_B = 100 μA	
S.NO	V_{CE}(V)	I_C(mA)	V_{CE}(V)	I_C(mA)	V_{CE}(V)	I_C(mA)

MODEL GRAPHS:

INPUT CHARACTERSTICS:



OUTPUT CHARECTERSTICS:



Basic Electrical-I Lab:

Objectives:

1. To learn how we can connect the different elements (like resistance) series and parallel in breadboard.
2. Learn the practical verification of the network theorem with the theoretical results
3. Know about the connection of wattmeter, and how the power can be calculated for a given load by using a particular wattmeter.

Learning Outcomes: By doing this practical students will gain the knowledge about the requirement of the breadboard in the circuit connection and the proper way of connection of the elements in the bread board. Upon the completion of this practical course, the student will be able to:

- Understand the series and parallel connection of the breadboard.
- Understand about the construction of a circuit by using the different electrical elements in a breadboard.
- Understand how the power can be measure of a given load by using a wattmeter.
- Verify the theoretical results with the practical one in different network theorem's.

Course Contents:
Exercises that must be done in this course are listed below:
Exercise No.1: Study of Ammeter, Voltmeter and Wattmeter
Exercise No. 2: Verification of Thevenin's Theorem in breadboard
Exercise No. 3: Verification of Norton's Theorem in breadboard
Exercise No. 4: Verification of Superposition Theorem in breadboard

Text Books:
1. Basic Electrical Engineering -Abhijit Chakrabarti, Sudipta Nath,Chandan Kumar Chanda

References:
1. Basic Electrical Engineering(vol2)-B.L.Thereja
2. Basic Electrical engineering, D.P Kothari & I.J Nagrath, TMH, Second Edition
3. Hughes Electrical & Electronics Technology, 8/e, Hughes, Pearson Education.

EXPERIMENT NO: 01

TITLE: Study of Ammeter, Voltmeter and Wattmeter

AIM:. To Study the Ammeter, Voltmeter and Wattmeter

APPARATUS REQUIRED: For Demonstration purpose
(i) Ammeter
(ii) Voltmeter
For practical purpose:-
(i) Wattmeter(UPF)
(ii) A plug top
(iii) Wire
(iv) A blub

THEORY:
1. **Ammeter:**

Ammeter is employed for measuring of current in a circuit and connected in series in the circuit. As ammeter is connected in series, the voltage drop across ammeter terminals is very low. This requires that the resistance of the ammeter should be as low as possible. The current coil of ammeter has low current carrying capacity whereas the current to be measured may be quite high. So for protecting the equipment a low resistance is connected in parallel to the current coil and it is known as shunt resistance

2. Voltmeter:

Voltmeter is employed to measure the potential difference across any two points of a circuit. It is connected in the parallel across any element in the circuit. The resistance of voltmeter is kept very high by connecting a high resistance in series of the voltmeter with the current coil of the instrument. The actual voltage drop across the current coil of the voltmeter is only a fraction of the total voltage applied across the voltmeter which is to be measured.

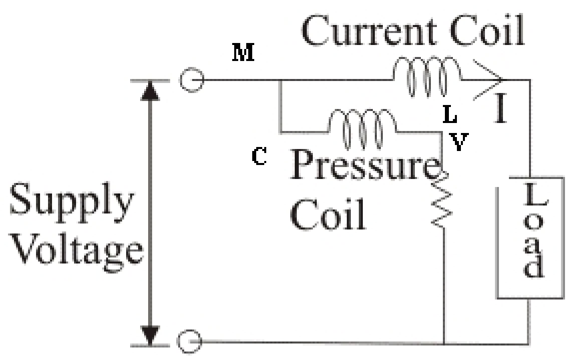
3. Wattmeter:

The measurement of real power in AC circuits is done by using an instrument using Wattmeter. The real power in AC circuits is given by expression

$$VI \cos \emptyset$$

where, cos Ø is power factor.

A wattmeter has two coils, namely, current coil and pressure coil. The current coil (CC) is connected in series with the load and the pressure coil (PC) is connected across the load. Watt meters are available in dual range for voltages as well as for current



Multiplying factor=(voltage setting*current setting)/(full scale deflection)
Rated Power=(Meter Reading*Multiplying factor)

CALCULATION:

Calculate the power of the given bulb for two different current settings and compare those results.

DISCUSSION:

EXPERIMENT NO: 02

TITLE: Verification of Thevenin's Theorem in breadboard

AIM: To Verify the Thevenin's Theorem in breadboard

APPARATUS REQUIRED:-

(i) Bread Board
(ii) Connecting Wire
(iii) Different values of resistances
(iv) A Dc power Source

THEORY:

Sometimes, we wish to determine the response in a single load resistance in a network. Thevenin Theorem enables us to replace the remainder of the network by a simple equivalent circuit. Determining response in the load resistance, then becomes easier. The use of Thevenin Theorem is specially very helpful and time saving when we wish to find the response for different values of load resistance. Thevenin Theorem states that current through a load resistance connected across any two points of an active network can be obtained by the formula:

$$I_L=V_{th}/(R_{th}+R_L)$$

Where V_{th} is the open circuit voltage at the terminals of R_L when R_L is disconnected and R_{th} is the equivalent resistance viewed from the output terminals when all the sources replaced by their internal resistance only(Deactivating all the sources).

CIRCUIT DIAGRAM:

Draw the circuit diagram as per the resistance and circuit are given in the lab.

CALCULATIONS:

Calculate the theoretical data's of the given circuit

OBSERVATION TABLE:

Values	V_{th}	R_{th}	I_L
Theoretical Value			
Practical Value			

Percentage Error= [(Observed-Calculated)/Calculated]*100

RESULT:

The percentage error is found to be__%.

DISCUSSION:

EXPERIMENT NO: 03

TITLE: Verification of Norton's Theorem in breadboard

AIM: To Verify the Norton's Theorem in breadboard

APPARATUS REQUIRED:-

(i) Bread Board
(ii) Connecting Wire
(iii) Different values of resistances
(iv) A Dc power Source

THEORY:

Sometimes, we wish to determine the response in a single load resistance in a network. Norton Theorem enables us to replace the remainder of the network by a simple equivalent circuit. Determining response in the load resistance, then becomes easier. The use of Norton Theorem is specially very helpful and time saving when we wish to find the response for different values of load resistance. Norton's Theorem states that current through a load resistance connected across any two points of an active network can be obtained by the formula:

$$I_L=(I_N*R_N)/(R_N+R_L)$$

Where I_N is the Short circuit current at the terminals of R_L when R_L Short circuited and we find out the short circuit current through the short circuit terminal and R_N is the equivalent resistance viewed from the output terminals when all the sources replaced by their internal resistance only(Deactivating all the sources).

CIRCUIT DIAGRAM:

Draw the circuit diagram as per the resistance and circuit are given in the lab.

CALCULATIONS:

Calculate the theoretical data's of the given circuit

OBSERVATION TABLE:

Values	I_N	R_N	I_L
Theoretical Value			
Practical Value			

Percentage Error= [(Observed-Calculated)/Calculated]*100

RESULT:

The percentage error is found to be__%.

DISCUSSION:

EXPERIMENT NO: 04

TITLE: Verification of Superposition Theorem in breadboard

AIM: To Verify the Superposition Theorem in breadboard

APPARATUS REQUIRED:-

(i) Bread Board
(ii) Connecting Wire

(iii) Different values of resistances
(iv) A Dc power Source

THEORY:

Superposition theorem states that in a linear network containing several independent sources, the overall response at any point in the network equals the sum of responses due to each independent source considered separately with all other independently sources made inoperative(short circuited). To make a source inoperative, it is short circuited leaving behind its internal resistance if it is a voltage source, and it is open circuited leaving behind its internal resistance if it is a current source.

In most electrical circuit analysis problems, a circuit is energized by a single independent energy source. In such cases, it is quite easy to find the response (i.e., current, voltage, power) in a particular branch of the circuit using simple network reduction techniques (i.e., series parallel combination, star delta transformation, etc.).

However, in the presence of more than one independent source in the circuit, the response cannot be determined by direct application of network reduction techniques. In such a situation, the principle of superposition may be applied to a linear network, to find the resultant response due to all the sources acting simultaneously.

The superposition theorem is based on the principle of superposition. The principle of Superposition states that the response (a desired current or the voltage) at any point in the linear network having more than one independent source can be obtained as the sum of responses caused by the separate independent sources acting alone. The validity of principle of superposition means that the presence of one excitation sources does not affect the response due to other excitations.

CIRCUIT DIAGRAM: Draw the circuit diagram as per the resistance and circuit are given in the lab.

CALCULATIONS: Calculate the theoretical data's of the given circuit

OBSERVATION TABLE:

Values	I_3	I_3’	I_3’’
Theoretical Value			
Practical Value			

I_3 = Current through the load terminal when we deactivate second source and consider for first source

I_3’= Current through the load terminal when we deactivate first source and consider for second source

I_3’’= I_3+ I_3’

Percentage Error= [(Observed-Calculated)/Calculated]*100

RESULT:

The percentage error is found to be__%.

DISCUSSION:

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR
Lab Manual

Title of Course: Engineering Drawing & Computer Graphics lab
Course Code: ME-191
L-T-P scheme: 1-0-3 **Course Credit: 3**

Objectives:
1. This course teaches the basics of engineering drawing utilising free hand sketching, mechanical drawing, and computer aided drafting and solid modelling.
2. To learn and understand the fundamental principles of orthographic projection as well as the topics of dimensioning, sectional views, isometric and perspective pictorials views, descriptive geometry and assembly drawings..
3. Drawings help us in developing our thoughts and ideas in to a final product
4. Drawings are also necessary for engineering industries since they are required and are being used at various stages of development of an engineering product.
5. To provide an understanding of the Industrial design aspects of different materials.

Learning Outcomes: Knowledge on the fundamentals of engineering drawing; ability to develop and/or comprehend a simple engineering drawing in both first and Third angle orthographic projections, international standards in engineering drawing practice and engineering graphics. A fundamental knowledge on computer aided graphics. Ability of freehand sketching, visualization of images and their dimensions. In this course student will learn how to communicate technical information by:

- **Visualization** – the ability to mentally understand visual information.
- **Graphics theory** – geometry and projection techniques used for preparation of drawings.
- **Use of standards** – set of rules for preparation of technical drawings.
- **Use of conventions** – commonly accepted practices in technical drawings.
- **Tools** – devices used to create technical drawings and models.
- **Applications** – the various uses for technical drawings.

Course Contents:
Experiments **that must be done in this course are listed below:**

Experiment No.1: Introduction to, lines, lettering, dimensioning. (Sketch book)
Experiment No.2: SCALES; Plain scale, Diagonal scale, comparative scale, vernier scale. (Sheet no 1)
Experiment No 3: Geometrical construction and curves; Construction of polygons, Parabola, hyperbola, Ellipse. (Sheet No. 2)
Experiment No.4: Orthographic projection- 1st and 3rd angle projection. (Sheet No. 3)
Experiment No.5: Projection of lines (sheet No. 4)
Experiment No.6: Projection of surfaces (sheet No. 5)
Experiment No.7: Projection of solids; Cube, Pyramid, Prism, Cylinder, Cone. (Sheet No. 6)
Experiment No.8: Drawing isometric view. (Sheet No. 7)
Experiment No.9: Full and half sectional views of solids & Development of surfaces; Prism, Cylinder, Cone. (Sheet No. 8)

Text Book: K.L. Narayana and P.Kannaiah, Text Book of engineering Drawing "Engineering Graphics", Scitech Publication

N.D. Bhatt, "Elementary Engineering Drawing", Charotar Book Stall, Anand, 1998

V. Lakshminarayanan And R.S. VaishWanar, "Engineering Graphics", Jain brothers, NewDelhi, 1998

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR
Lab Manual

Recommended Equipments/Systems/Software Requirements:
1. Drawing instruments, pencils, mini drafter
2. Auto cad software, computer system.

Experiment No. 1 Introduction to engineering drawing, lines, lettering, dimensioning. (Sketch book).
Aim: Introduction to engineering drawing, lines, lettering, dimensioning
Introduction
Drawing is the Graphical means of expression of technical details without the barrier of a language. Engineering Drawing is the Universal Language for Engineers.
Communication in engineering is necessary for effectively transferring one's ideas to others. While communicating, we use our memory to remember objects, sense organs to perceive objects and mind to imagine objects. Our perception are coloured or modified by our past experiences.
We see things around us, perceive the objects and identify them by their names. Later, when we hear these names we can remember these items easily and imagine various features like the shape, size, color, functions etc, e.g. if I say that a particular object is having the shape of a cricket bat, it is easy for a high school student to imagine the shape of the object since he has seen a cricket bat and has perceived the object. If I say that a particular object looks like the Dendrite formed during solidification of a metal, then it is difficult for the same student to imagine, since he has not seen a dendrite. His question will "how do a dendrite look like?" when we say that dendrite means tree-like structure, his imagination can go to different types of trees, but still he may not have a clear picture of the dendrite. If we show him a picture of a dendrite, he can very easily perceive that object.
One picture/drawing is equivalent to several sentences. It is not easy for anyone to make another person understand somebody's face just by explaining the features. Even if several sentences are used to explain the features of the face, words it would be difficult for the listener to perceive the image of the face. However, if you show a sketch or a photograph of the person, all these sentences can be saved. i.e., We grasp information easily if it is illustrated with diagrams, sketches, pictures, etc.

Engineering drawing

Drawings help us in developing our thoughts and ideas in to a final product. Drawings are also necessary for engineering industries since they are required and are being used at various stages of development of an engineering product. Engineering drawing is completely different from artistic drawing which are used to express aesthetic, philosophical, and abstract ideas. In an industry, these drawings help both the technical as well as commercial staffs at various stages like:

- conceptual stage
- design stage
- modification stage
- prototype development stage
- process and production planning
- production
- inspection
- marketing
- Servicing and maintenance, etc.

DRAWING INSTRUMENTS AND ACCESSORIES

the following set of instruments are required for ensuring perfection in manual drawing:

1. **Drawing board**

Drawing board is made of soft wooden platens. Almost perfect planning of the working surface of the drawing board is to be ensured. A strip of hard ebony edge is fitted up in a groove on the shorter edge drawing board is shown in Table 1.1 below. D2 size of drawing board is normally recommended for the First year engineering students.

Table 1.1. Standard dimension of Engineer's Drawing Board

Designation	Length x Width (mm)	Recommended for use with sheet sizes
D0	1500 x 1000	A0
D1	1000 x 700	A1
D2	700 x 500	A2
D3	500 x 500	A3

D0 and D1 for drawing offices, for students use – D2

2. **Drawing Sheet**

Drawing sheet is the medium on which drawings are prepared by means of pencils or pen. Drawing sheets are available in standard sizes as shown in Table 1.2. A standard A0 size sheet is the one with an area of 1 m-2 and having dimensions of 1189 x 841. Each higher number sheet (A1, A2, A3, etc. in order) is half the size of the immediately lower numbered sheet. For drawing practice for first year engineering students A2 size is the preferred drawing sheet. The recommended sizes obtained for various drawing sheets are shown in figure 1

Table 1.2 Standard Sizes of Drawing sheets as per BIS

Designation	Size (mm)
A0	841 x 1189
A1	594 x 841
A2	420 x 594
A3	297 x 420
A4	210 x 297

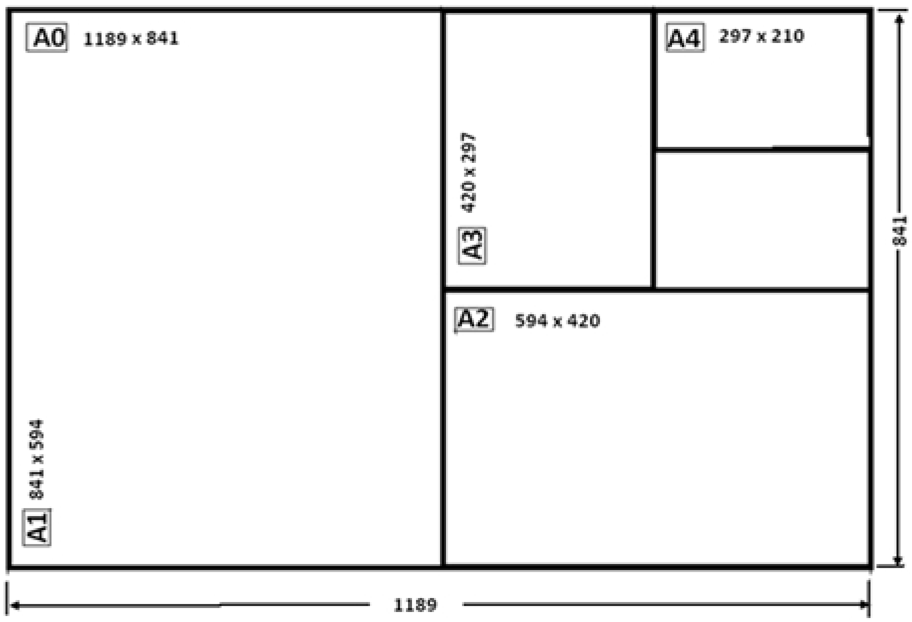


Figure 1. Recommended sizes obtained for various drawing sheets

3. **Mini-drafter**

This is a device used to draw parallel or inclined lines very effectively with ease. This is mounted on the top left corner of the drawing board by means of a clamping mechanism which is an integral part of the device. Figure 2 shows the photograph of a typical college level mini drafter. An L-shaped scale which is graduated in millimeters acts as the working edge of the mini-drafter. The L-Shaped scale also has a degree scale for angle measurement. The working edge can be moved to any desired location on the drawing board.

Procedure for clamping the mini-drafter

Set the protractor head with reference mark indexing zero degree, then fix the clamp of the mini-drafter at the top left corner either along the top horizontal edge of the board or along the left vertical edge of the board. With the drawing sheet placed underneath the scales of the mini-drafter, fix the drawing sheet to the drawing board with the scales of the mini- drafter aligned either with the vertical or the horizontal borderlines of the drawing sheet.

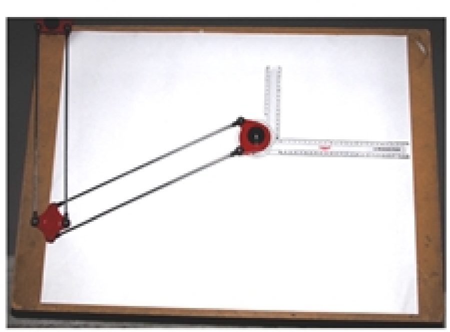


Figure 2. Photograph of a typical college level drawing table,

4. **Set squares**

Set squares are a set of 45° set square and 30°-60° set-square, as shown in figure 3.They are used in conjunction with each other and with T-square to draw parallel, inclined and perpendicular lines. They are made of transparent acrylic. Each is having beveled edges with engraved mm or inch marking. The 45° set square generally has a protractor where as the 30°-60° set-square includes French curves.

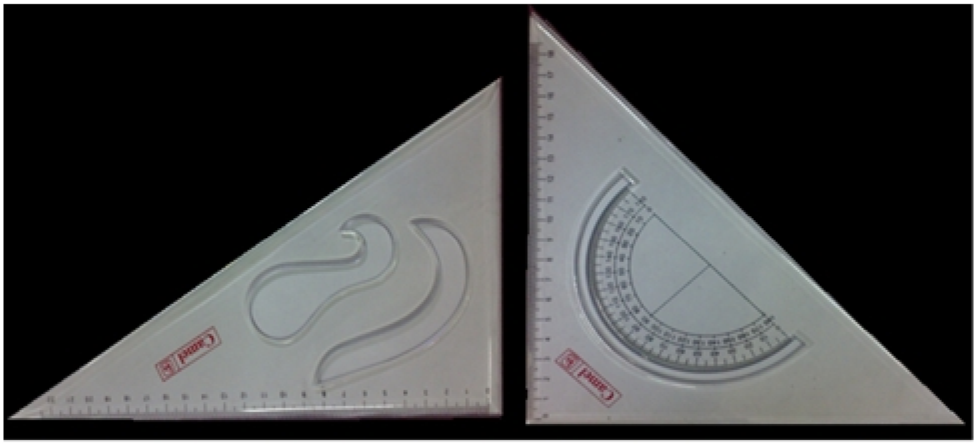


Figure 3. Set Square set

5. **Compasses**

These are used to draw arcs or circles. Generally two sizes of compasses: one large compass and the other a small spring bow compass are commonly found. Each compass consists of a needle point and a pencil point. For drawing very large radius arcs, the pencil point leg can be removed from the knee joint and a lengthening bar can be inserted to increase the radius of the arc. Figure 4 shows the photograph of a compass. Figure 4 shows the photograph of a compass.

Figure 4. Photograph of a compass

6. **Divider**

Dividers are used to transfer lengths to the drawings either from scales or from the drawing itself. Similar to the compasses, two sizes of dividers are used in technical drawings. One large divider and the other small spring bow divider.

7. **Pencils / lead sticks/ pencil sharpener / eraser/etc**:

The primary tool used in technical drawings is the pencil or lead sticks. Generally for technical drawings, the three grades of pencil used is HB, H and 2H. For different purposes, different grades of pencils are used. Pencil sharpener is used to mend the pencils. Eraser is used to erase the unnecessary part of the pencil drawing.

8. **French curve/Flexible curve**

French curve is free form template make of acrylic and is used to draw a smooth curve passing through a number of points. The outer profile of the French curve is adjusted such the smooth curve passes through more than three points and a curve passing through these lines are drawn. The next part of the curve is then drawn by using the next three points in addition to the last two points of the previous curve. A typical French curve is shown in figure 6.
A flexible curve is consists of a flexible, generally made of metallic wire coated with a thick rubber material. This can be bend in to any shape so that its working edge can be matched with a number of points and a smooth curve can be.

Figure 6. A typical French Curve.

Layout of drawing sheets

Any engineering drawing has to follow a standard format. The drawing sheet consists of drawing space, title block and sufficient margins. After fixing the drawing sheet on the drawing board, margins should be drawn. The layout should facilitate quick reading of important particulars. Drawings are prepared at various locations and shared and quick references should be located easily. A typical drawing sheet is shown in figure 4 and consists of the following:

a. Borders – space left all around in between the trimmed edges of the sheet. A minimum of 10 mm
b. Filling margin – 20 mm minimum on left hand side with border included. This is provided for taking perforations.
c. Grid reference system – For all sizes of drawing sheets for easy location of drawing within the frame. The length and the width of the frames are divided into even number of divisions.

the grids lies between 25 mm to 75mm depending on the Drawing sheet size. The grids along vertical edges are named by capital letters where as grids along the horizontal edges are by numerals. Numbering and lettering start from the corner of the sheet opposite to the title box and are repeated on the opposite sides. The numbers and letters are written upright. Repetition of letters or numbers like AA, BB, etc. is practiced in case they exceed that of the alphabets.

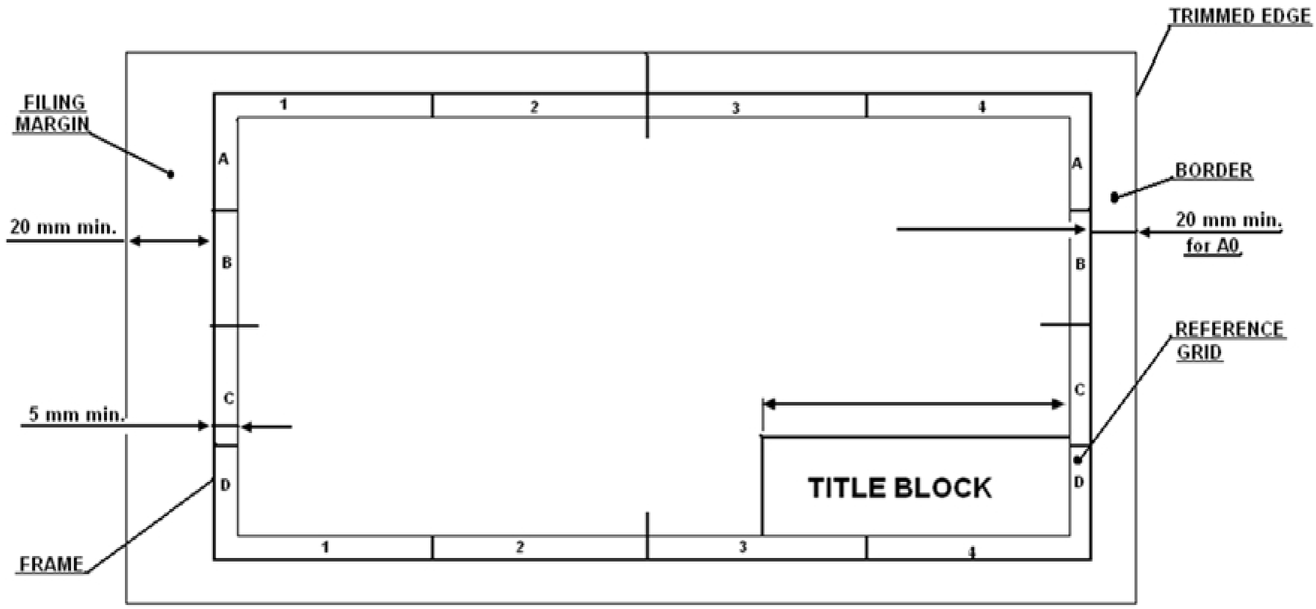


Figure 7. Typical drawing layout showing the margins, location of title block and grids.

d. **Title box** – An important feature which is a must in every drawing sheet. The title box is drawn at the bottom right hand corner of every drawing sheet and provides technical and administrative details regarding the drawing/component. Though there are various dimensions for the title box, for engineering students it is advisable to use a title box of size 170 mm x 65 mm.

The title box is divided in to two zones: (a) part identification zone and (b) additional information zone. In the part identification zone, information like the component identification number , name of the part, the legal owner of the drawing (i.e. the name of firm/component/etc will be highlighted where as in the additional information zone, technical information like symbols indicating the system of projection, scale of drawing, method of indicating surface texture, geometric tolerances, etc. will be highlighted.

Lines

Lines is one important aspect of technical drawing. Lines are always used to construct meaningful drawings. Various types of lines are used to construct drawing, each line used in some specific sense. Lines are drawn following standard conventions mentioned in BIS (SP46:2003). A line may be curved, straight, continuous, segmented. It may be drawn as thin or thick. A few basic types of lines widely used in drawings are shown in Table 1.

Table 1. Types of llines used in engineering drawing.

Illustration	Application
Thick	Outlines, visible edges, surface boundaries of objects, margin lines
Continuous thin	Dimension lines, extension lines, section lines leader or pointer lines, construction lines, boarder lines
Continuous thin wavy	Short break lines or irregular boundary lines – drawn freehand
Continuous thin with zig-zag	Long break lines
Short dashes, gap 1, length 3 mm	Invisible or interior surfaces
Short dashes .q	Center lines, locus lines Alternate long and short dashes in a proportion of 6:1,
Long chain thick at end and thin elsewhere	Cutting plane lines

Line Strokes

Line strokes refer to the directions of drawing straight and curved lines. The standards for lines are given in BIS: SP-46, 2003

Vertical and inclined lines are drawn from top to bottom, horizontal lines are drawn from left to right. Curved lines are drawn from left to right or top to bottom. The direction of strokes is illustrated in figure 1.

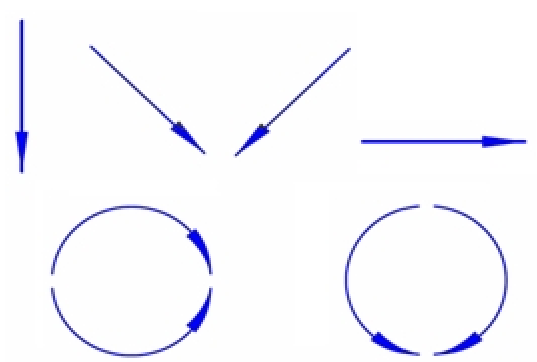


Figure 1. The line strokes for drawing straight and curved lines.

Lettering – BIS: 9609

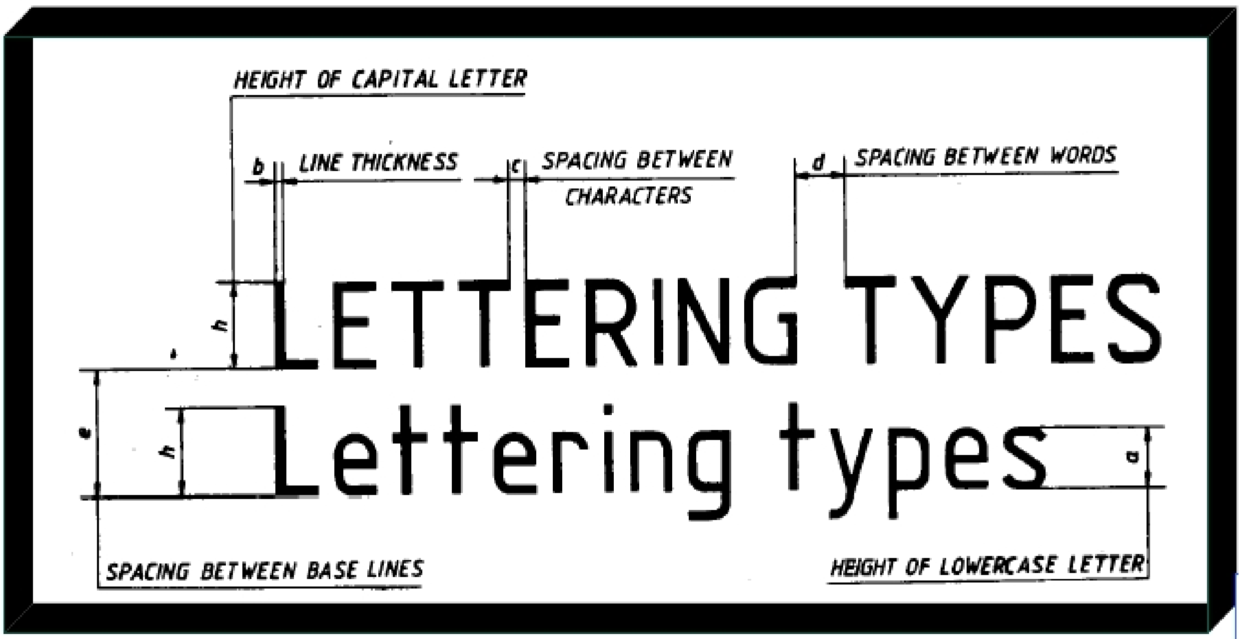
• Single stroke lettering for use in engineering drawing – width of the stem of the letters and numerals will be uniformly thick equal to thickness of lines produced by the tip of the pencil.

• **Single stroke does not mean – entire letter written without lifting the pencil/pen**

Lettering types

• **Lettering A** – Height of the capital letter is divided into 14 equal parts

• **Lettering B** – Height of the capital letter is divided into 10 equal parts



Heights of Letters and Numerals

• Height of the capital letters is equal to the height of the numerals used in dimensioning

• Height of letters and numerals – different for different purposes

Sr. No.	Item	Size (mm)
1	Name of the company	**10**, 14, 20
2	Drawing numbers, letters denoting section planes	**10**, 14
3	Title of the Drawing	**7**, 10
4	Sub-titles and heading	5, **7**
5	Dimensioning, Notes, Schedules, Material list	3.5, **7**
6	Alteration entries and tolerances	3.5

Specifications of A -Type Lettering

Specifications	Value	Size (mm)						
Capital letter height	**h**	**2.5**	**3.5**	**5**	**7**	**10**	**14**	**20**
Lowercase letter height	**a = (5/7)h**	**-**	**2.5**	**3.5**	**5**	**7**	**10**	**14**
Thickness of lines	**b = (1/14)h**	**0.18**	**0.25**	**0.35**	**0.5**	**0.7**	**1**	**1.4**
Spacing between characters	**c = (1/7)h**	**0.35**	**0.5**	**0.7**	**1**	**1.4**	**2**	**2.8**
Min. spacing b/n words	d = (3/7)h	1.05	1.5	2.1	3	4.2	6	8.4
Min. spacing b/n baselines	**e = (10/7)h**	**3.5**	**5**	**7**	**10**	**14**	**20**	**28**

Specifications of B -Type Lettering

Specifications	Value	Size (mm)						
Capital letter height	h	2.5	3.5	5	7	10	14	20
Lowercase letter height	a = (7/10)h	-	2.5	3.5	5	7	10	14
Thickness of lines	b = (1/10)h	0.25	0.35	0.5	0.7	1	1.4	2
Spacing between characters	c = (1/5)h	0.5	0.7	1	1.4	2	2.8	4
Min. spacing b/n words	d = (3/5)h	1.5	2.1	3	4.2	6	8.4	12
Min. spacing b/n baselines	e = (7/5)h	3.5	5	7	10	14	20	28

Drawing standards

ANSI – American National Standards Institute

ANSI Y14.1 1980 (R1987) – Drawing sheet size and format

ANSI Y 14.2M-1979 (R1987) – Line conventions and lettering

ANSI Y14.5M-1982(R1988) – Dimensioning and tolerances

ANSI Y 14.3-1975(R1987) – Multi view and sectional view drawings

ISO – International Standards Organization

JIS – Japanese Standards

BIS – Bureau of Indian Standards

Dimensioning
The size and other details of the object essential for its construction and function, using lines, numerals, symbols, notes, etc are required to be indicated in a drawing by proper dimensioning. These dimensions indicated should be those that are essential for the production, inspection and functioning of the object and should be mistaken as those that are required to make the drawing of an object. The dimensions are written either above the dimension lines or inserted at the middle by breaking the dimension lines.

Normally two types of dimensioning system exist. i.e. Aligned system and the unidirectional system. These are shown in figure 3.

In the aligned system the dimensions are placed perpendicular to the dimension line in such a way that it may be read from bottom edge or right hand edge of the drawing sheet. The horizontal and inclined

hand side of the drawing sheet.
In the unidirectional system, the dimensions are so oriented such that they can be read from the bottom of the drawing.

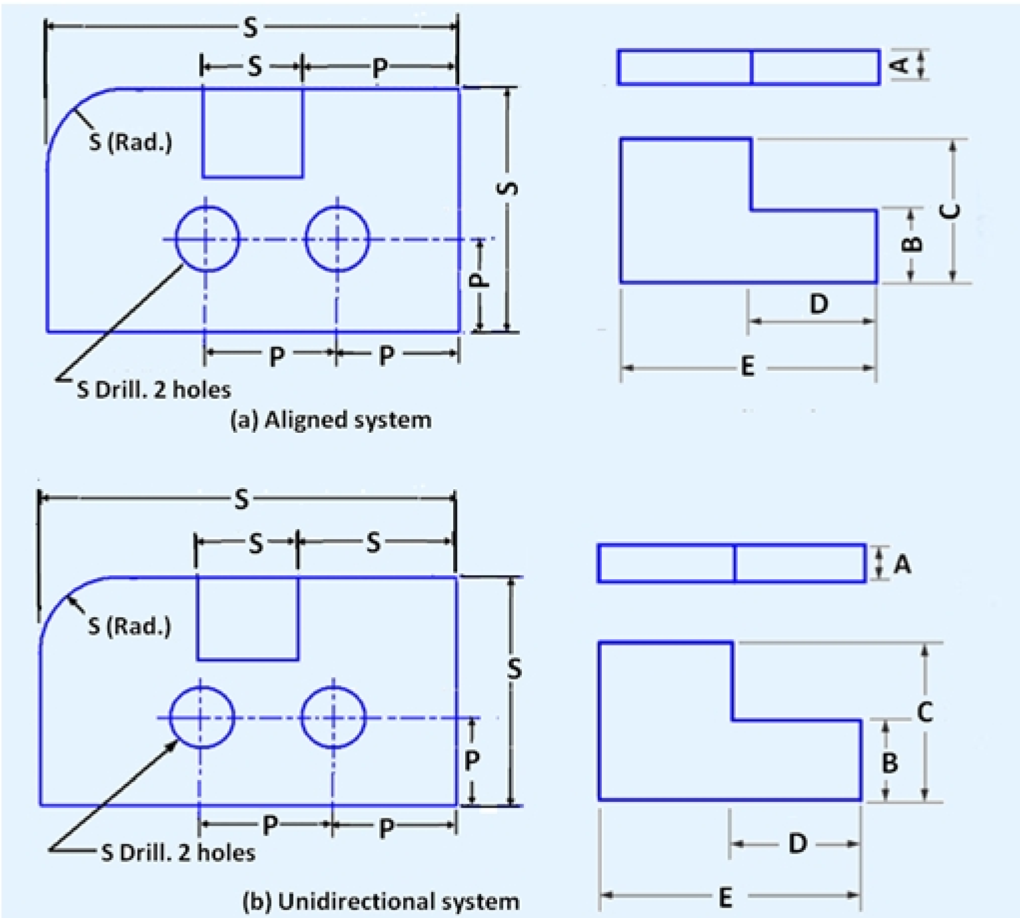


Figure 3. The aligned system and unidirectional system of dimensioning.

Rules to be followed for dimensioning. Refer figure 4.

- Each feature is dimensioned and positioned only once.
- Each feature is dimensioned and positioned where its shape shows.
- Size dimensions – give the size of the component.
- Every solid has three dimensions, each of the geometric shapes making up the object must have its height, width, and depth indicated in the dimensioning.

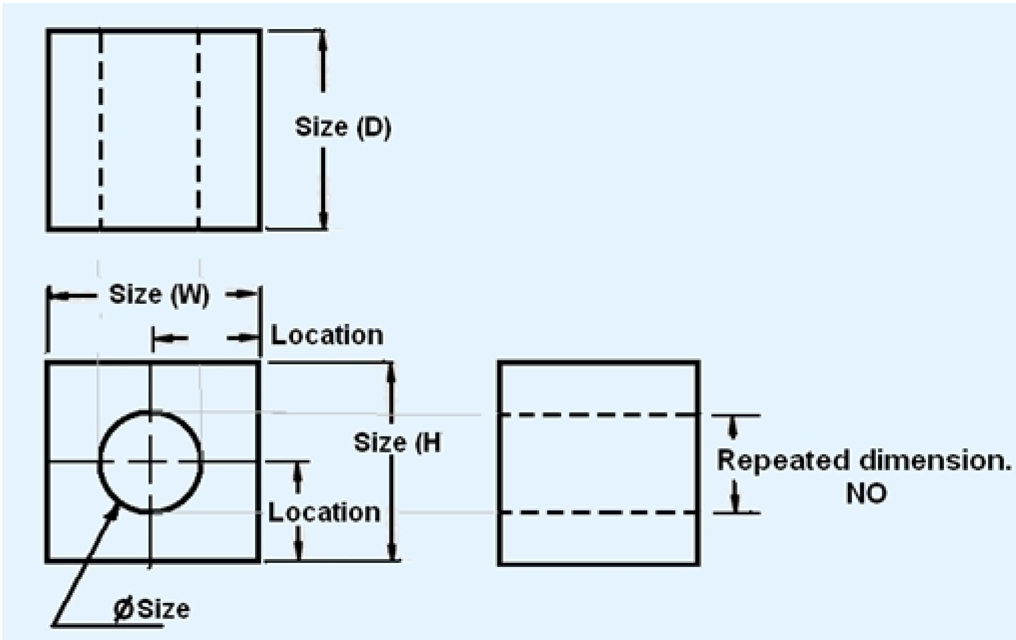


Figure 4. Typical dimension lines

Dimensioning consists of the following:

- A thin, solid line that shows the extent and direction of a dimension. Dimension lines are broken for insertion of the dimension numbers
- Should be placed at least 10 mm away from the outline and all
- other parallel dimensions should be at least 6 mm apart, or more, if space permits

The important elements of dimensioning consist of extension lines, leader line, arrows and dimensions.

Extension line – a thin, solid line perpendicular to a dimension line, indicating which feature is associated with the dimension. There should be a visible gap of 1.5 mm between the feature's corners and the end of the extension line. Figure 5 shows extension lines.

Leader line

A thin, solid line used to indicate the feature with which a dimension, note, or symbol is associated. Generally this is a straight line drawn at an angle that is neither horizontal nor vertical. Leader line is terminated with an arrow touching the part or detail. On the end opposite the arrow, the leader line will have a short, horizontal shoulder. Text is extended from this shoulder such that the text height is centred with the shoulder line

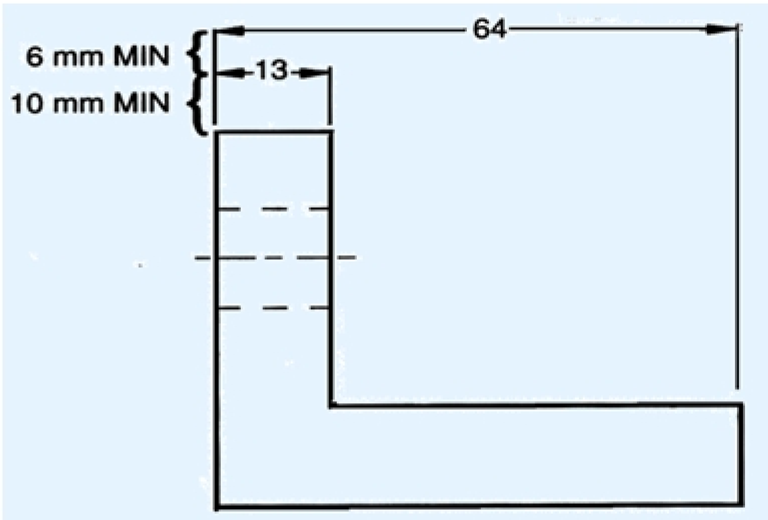


Figure 5. Showing extension lines

- Arrows – 3 mm wide and should be 1/3rd as wide as they are long - symbols placed at the end of dimension lines to show the limits of the dimension. Arrows are uniform in size and style, regardless of the size of the drawing. Various types of arrows used for dimensioning is shown in figure 6.

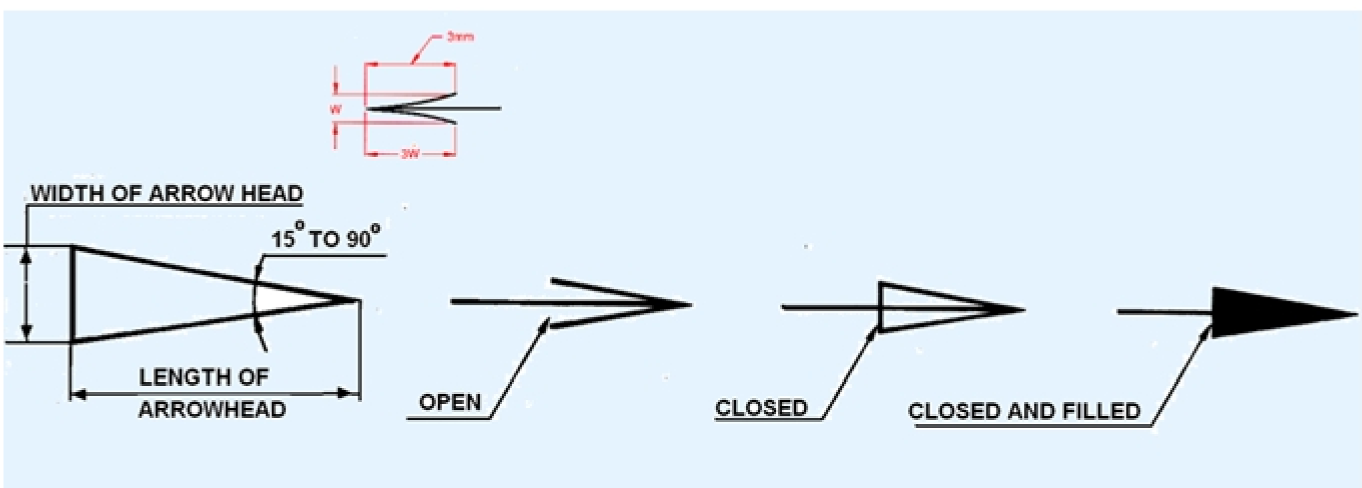


Figure 6.Various types of arrows used for dimensioning

The specification of dimension lines are shown in figure 7.

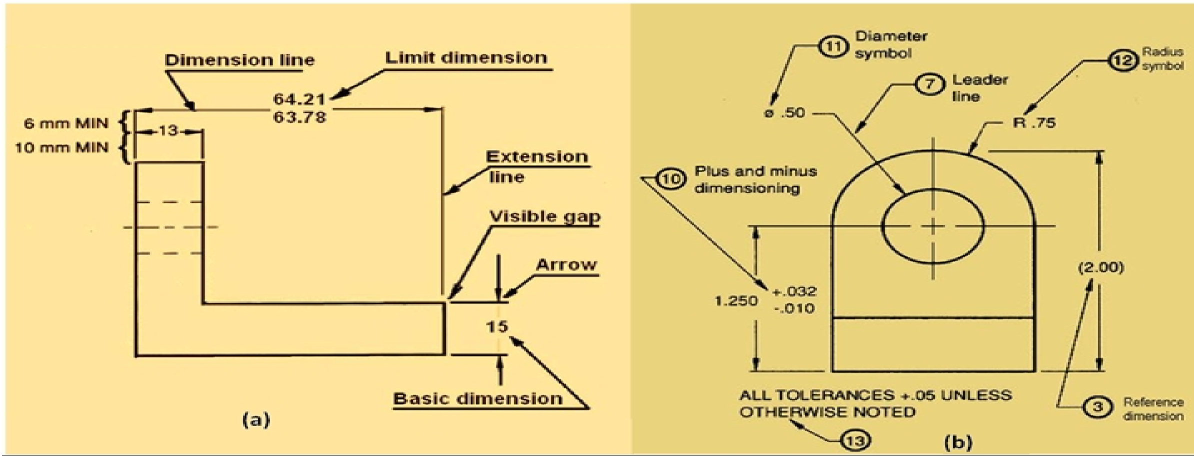


Figure 7 showing the specification of dimension lines.

Dimensioning of angles: The normal convention for dimensioning of angles is illustrated in figure 8.

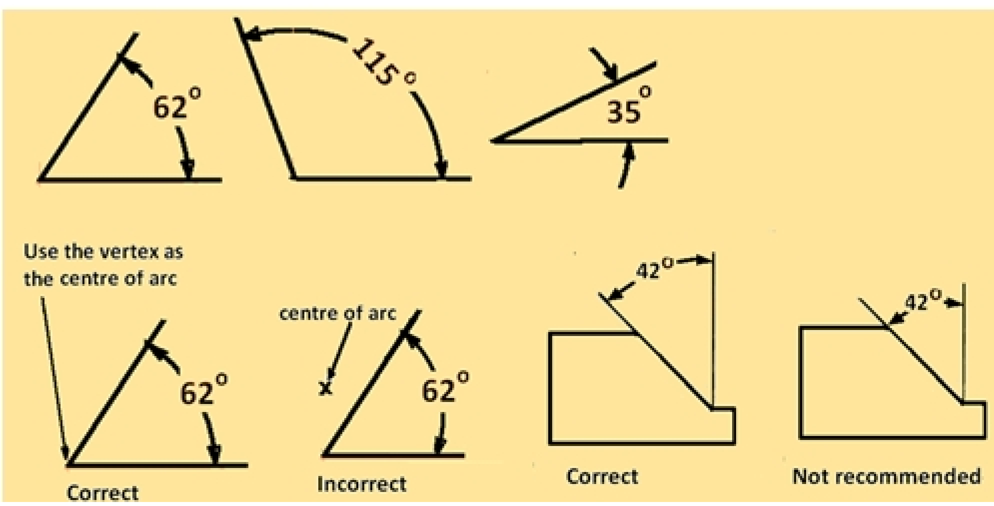


Figure 8 conventions used for dimensioning angles.

RULES OF DIMENSIONING

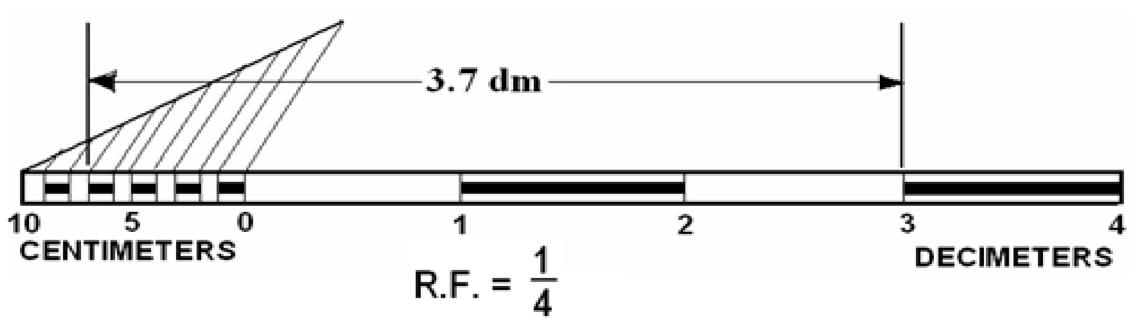
1. Between any two extension lines, there must be one and only one dimension line bearing one dimension.
2. As far as possible, all the dimensions should be placed outside the views. Inside dimensions are preferred only if they are clearer and more easily readable.
3. All the dimensions on a drawing must be shown using either Aligned System or Unidirectional System. In no case should, the two systems be mixed on the same drawing.
4. The same unit of length should be used for all the dimensions on a drawing. The unit should not be written after each dimension, but a note mentioning the unit should be placed below the drawing.
5. Dimension lines should not cross each other. Dimension lines should also not cross any other lines of the object.
6. All dimensions must be given.
7. Each dimension should be given only once. No dimension should be redundant.

8. Do not use an outline or a centre line as a dimension line. A centre line may be extended to serve as an extension line.
9. Avoid dimensioning hidden lines.
10. For dimensions in series, adopt any one of the following ways.
    i. Chain dimensioning (Continuous dimensioning) All the dimensions are aligned in such a way that an arrowhead of one dimension touches tip-to-tip the arrowhead of the adjacent dimension. The overall dimension is placed outside the other smaller dimensions.
    ii. Parallel dimensioning (Progressive dimensioning) All the dimensions are shown from a common reference line. Obviously, all these dimensions share a common extension line. This method is adopted when dimensions have to be established from a particular datum surface
    iii. Combined dimensioning. When both the methods, i.e., chain dimensioning and parallel dimensioning are used on the same drawing, the method of dimensioning is called combined dimensioning.

Experiment No: 2. (a) PLAIN SCALE

Aim: Construct a plain scale of RF = 1:4, to show centimetres and long enough to measure up to 5 decimetres.
APPARATUS: - (i) mini drafter. (ii) Pencils (iii) compass (iv) drawing sheet (v) drawing board or table
CONSTRUCTION:-

- R.F. = ¼
- Length of the scale = R.F. × max. length = ¼ × 5 dm = 12.5 cm.
- Draw a line 12.5 cm long and divide it in to 5 equal divisions, each representing 1 dm.
- Mark 0 at the end of the first division and 1, 2, 3 and 4 at the end of each subsequent division to its right.
- Divide the first division into 10 equal sub-divisions, each representing 1 cm.
- Mark cm to the left of 0 as shown.
- Draw the scale as a rectangle of small width (about 3 mm) instead of only a line.
- Draw the division lines showing decimeters throughout the width of the scale.
- Draw thick and dark horizontal lines in the middle of all alternate divisions and sub-divisions.
- Below the scale, print DECIMETERS on the right hand side, CENTIMERTERS on the left hand side, and R.F. in the middle.

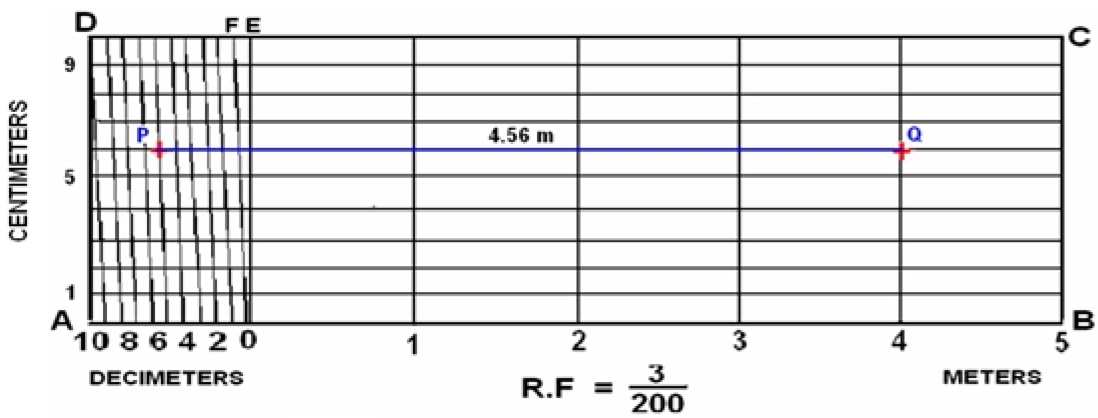


Experiment 2(b): DIAGONAL SCALE

AIM: Construct a Diagonal scale of RF = 3:200 showing meters, decimeters and centimeters. The

APPARATUS: - (i) mini drafter. (ii) Pencils (iii)compass (iv)drawing sheet (v) drawing board or table
CONSTRUCTION:-

- Length of the scale = (3/200) x 6 m = 9 cm
- Draw a line AB = 9 cm . Divide it in to 6 equal parts.
- Divide the first part A0 into 10 equal divisions.
- At A draw a perpendicular and step-off along it 10 equal divisions, ending at D.
- Complete the rectangle ABCD.
- Draw perpendiculars at meter-divisions i.e. 1, 2, 3, and 4.
- Draw horizontal lines through the division points on AD. Join D with the end of the first division along A0 (i.e. 9).
- Through the remaining points i.e. 8, 7, 6, … draw lines // to D9.
- PQ = 4.56 meters



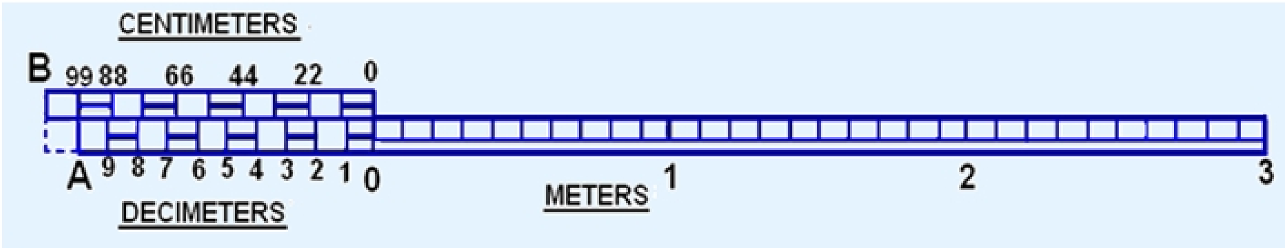
DIAGONAL SCALE

Experiment No. 2(c) VERNIER SCALE

AIM: Draw a Vernier scale of R.F. = 1/25 to read up to 4 meters. On it show lengths 2.39 m and 0.91 m.

APPARATUS: - (i) mini drafter. (ii) Pencils (iii) compass (iv) drawing sheet (v) drawing board or table
CONSTRUCTION:-

- Length of Scale = (1/25) × (4 × 100) = 16 cm
- Draw a 16 cm long line and divide it into 4 equal parts. Each part is 1 meter. Divide each of these parts in to 10 equal parts to show decimeter (10 cm).
- Take 11 parts of dm length and divide it in to 10 equal parts. Each of these parts will show a length of 1.1 dm or 11 cm.
- To measure 2.39 m, place one leg of the divider at *A* on 99 cm mark and other leg at *B* on 1.4 mark. (0.99 + 1.4 = 2.39).
- To measure 0.91 m, place the divider at *C* and *D* (0.8 +0.11 = 0.91).



Experiment No. 2(d) COMPARATIVE SCALE

AIM: Construct a plain comparative Scales of RF = 1/624000 to read up to 50 kms and 40 miles. On these show the kilometer equivalent to 18 miles

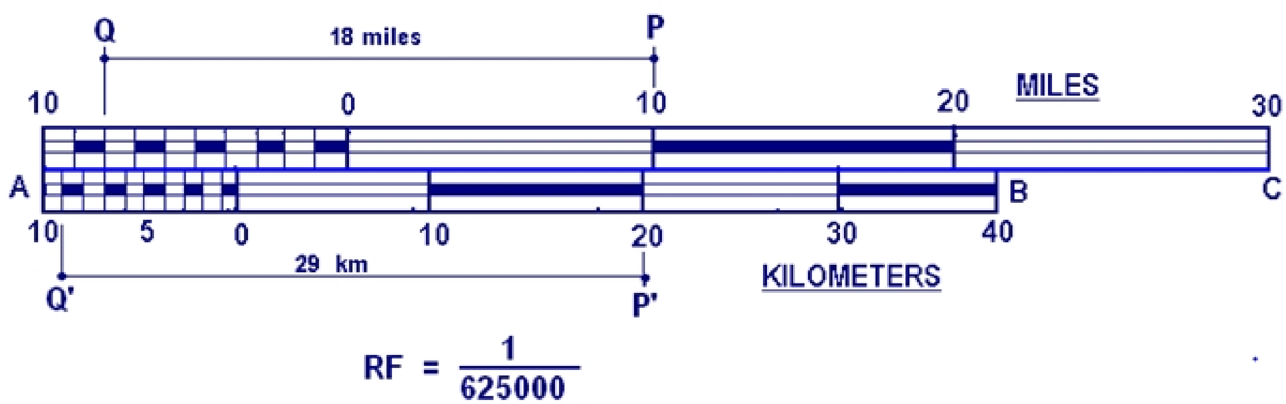
APPARATUS: - (i) mini drafter. (ii) Pencils (iii) compass (iv) drawing sheet (v) drawing board or table

CONSTRUCTION:-

KILOMETER SCALE — MILE SCALE

LOS= (1/625000) X 50 X 1000 X 100= 8cm   LOS= (1/625000) X 40 X 1760 X 3 X 12= 4 in

Draw a 4 in. line AC and construct a plain scale to represent mile and 8cm line AB and construct the kilometer scale below the mile scale.
On the mile scale, determine the distance equal to 18 miles (PQ)
Mark P'Q' = PQ on the kilometer scale such that P' will coincide with the appropriate main division.
Find the length represented by P'Q'.
P'Q' = 29 km.   (1Mile = 1.60934 km)



EXPERIMENT NO. 3(a) ELLIPSE BY RECTANGLE METHOD.

Aim: Draw an ellipse with a 70 mm long major axis and a 45 mm long minor axis.

Or

Draw an ellipse circumscribing a rectangle having sides 70 mm and 45 mm.

APPARATUS: - (i) mini drafter. (ii) Pencils (iii) compass (iv) drawing sheet (v) drawing board or table (vi) French curve

1. Draw the major axis AB = 70 mm and minor axis CD = 45 mm, bisecting each other at right angles at O.

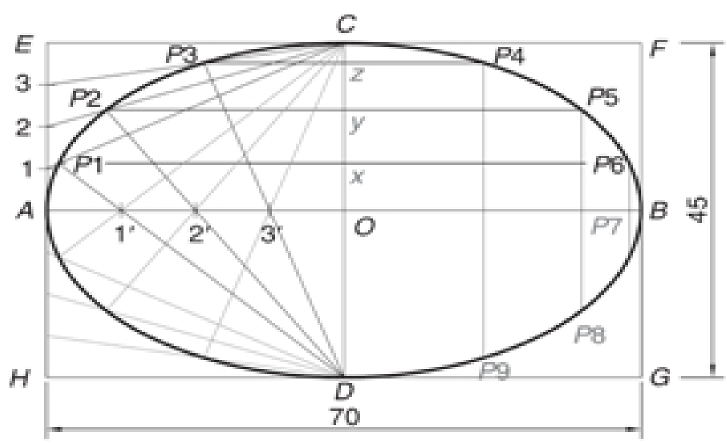
2. Draw a rectangle EFGH such that EF = AB and FG = CD.

3. Divide AO and AE into same number of equal parts, say 4. Number the divisions as

1, 2, 3 and 1', 2', 3', starting from A.

4. Join C with 1, 2 and 3.

5. Join D with 1' and extend it to meet C–1 at P1. Similarly, join D with 2' and 3' and extend them to meet C–2 and C–3 respectively to locate P/2 and P/3.



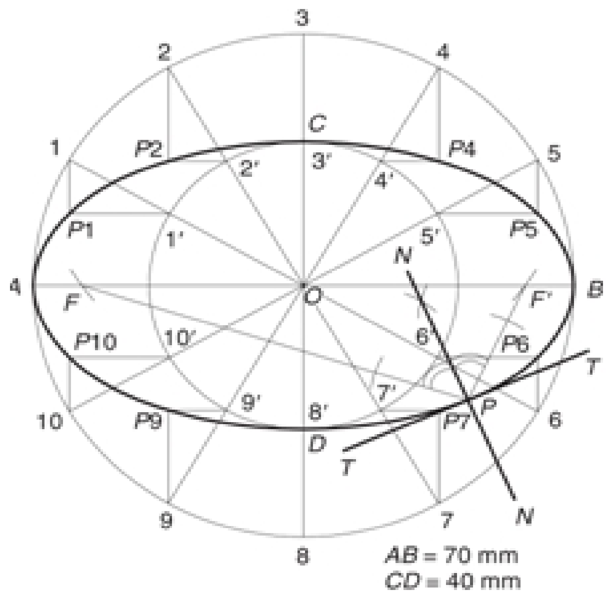
Experiment No. 3(b) ELLIPSE BY CONCENTRIC CIRCLE METHOD

Aim: Draw an ellipse having the major axis of 70 mm and the minor axis of 40 mm.

or

Draw the major axis AB = 70 mm and minor axis CD = 40 mm, bisecting each other at right angles at O.

- Draw two circles with AB and CD as diameters. Divide both the circles into 12 equal parts and number the divisions as A, 1, 2, 3, …10, B and C, 1', 2', 3' … 10', D.
- Through 1, draw a line parallel to CD. Through 1', draw a line parallel to AB. Mark P1 at their intersection.
- Obtain P/2, P4, P5, etc., in a similar way.
- Draw a smooth closed curve through A– P1–P/2– C– P4– P5– B– P6– P7– D– P/9– P10–A.



Experiment No.3(c) PARABOLA BY DIRECTRIX FOCUS METHOD

Aim: Draw a parabola if the distance of the focus from the directrix is 60 mm.

1. Draw directrix AB and axis CC’ as shown.

2. Mark F on CC’ such that CF = 60 mm.

3. Mark V at the midpoint of CF. Therefore, e = VF/VC = 1.

4. At V, erect a perpendicular VB = VF. Join CB.

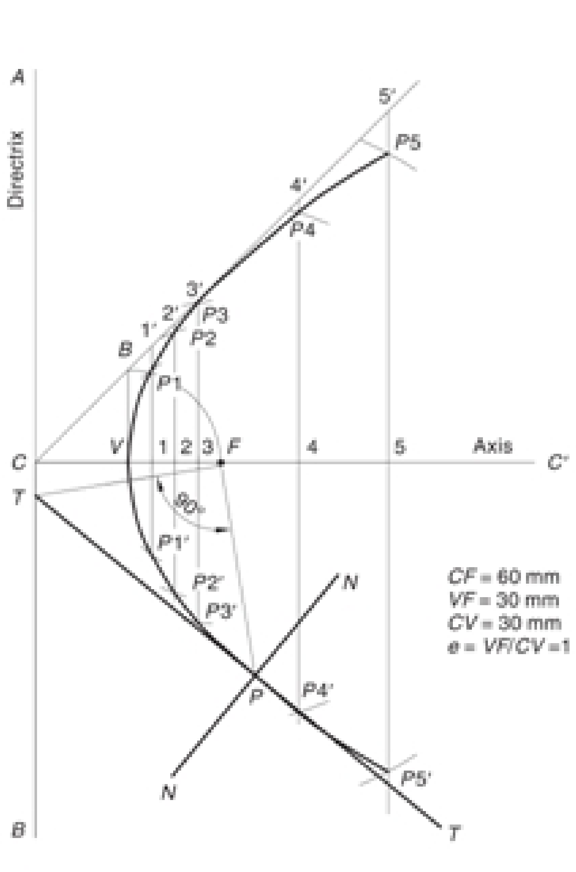
5. Mark a few points, say, 1, 2, 3, … on VC’ and erect perpendiculars through them meeting CB produced at 1’, 2’, 3’,…

6. With F as a centre and radius = 1–1’, cut two arcs on the perpendicular through 1 to locate P1 and

P1’. Similarly, with F as a centre and radii = 2–2’, 3–3’, etc., cut arcs on the corresponding

perpendiculars to locate P2 and P2’, P3 and P3’,etc.

7. Draw a smooth curve passing through V, P1, P2,P3…P3



Experiment No. 3(d) PARABOLA BY RECTANGLE METHOD

Aim: Draw a parabola having an abscissa of 30 mm and the double ordinate of 70 mm.

1. Draw the double ordinate RS = 70mm. At midpoint K erect a perpendicular KV = 30 mm to represent the abscissa.

2. Construct a rectangle RSMN such that SM = KV.

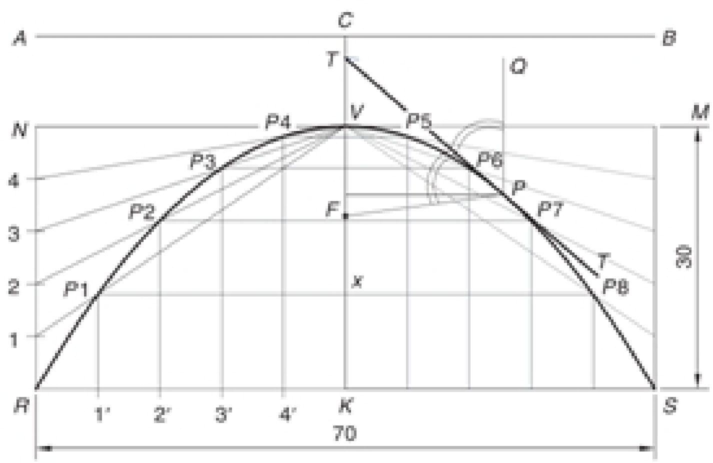
3. Divide RN and RK into the same number of equal parts, say 5. Number the divisions as 1, 2, 3, 4 and 1', 2', 3', 4', starting from R.

4. Join V–1, V–2, V–3 and V–4.

5. Through 1', 2', 3' and 4', draw lines parallel to KV to meet V–1 at P1, V–2 at P2, V–3 at P3 and V–4 at P4, respectively.

6. Obtain P5, P6, P7 and P8 in the other half of the rectangle in a similar way. Alternatively, these points can be obtained by drawing lines parallel to RS through P1, P2, P3 and P4. For example, draw P1– P8 such that P1– x = x– P8.

7. Join P1, P2, P3 … P8 to obtain the parabola.



Experiment No. 4 ORTHOGRAPHIC PROJECTION

Aim: Draw the orthographic projection of given object using first angle projection method.

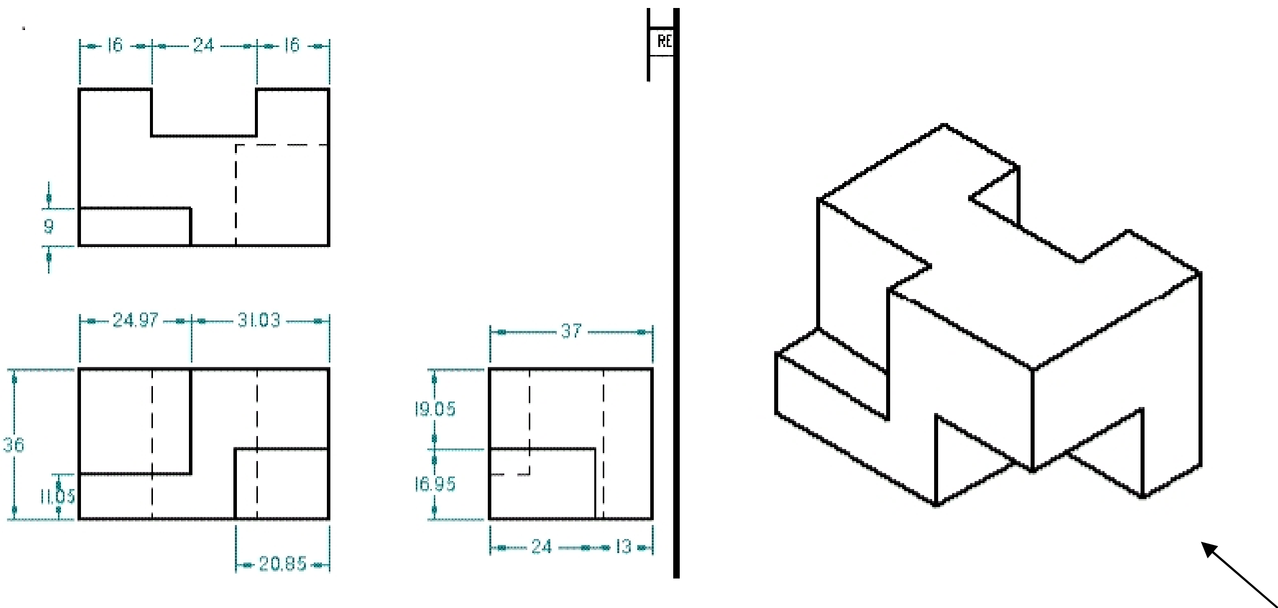
APPARATUS: - (i) mini drafter. (ii) Pencils (iii) compass (iv) drawing sheet (v) drawing board or table

CONSTRUCTION:-

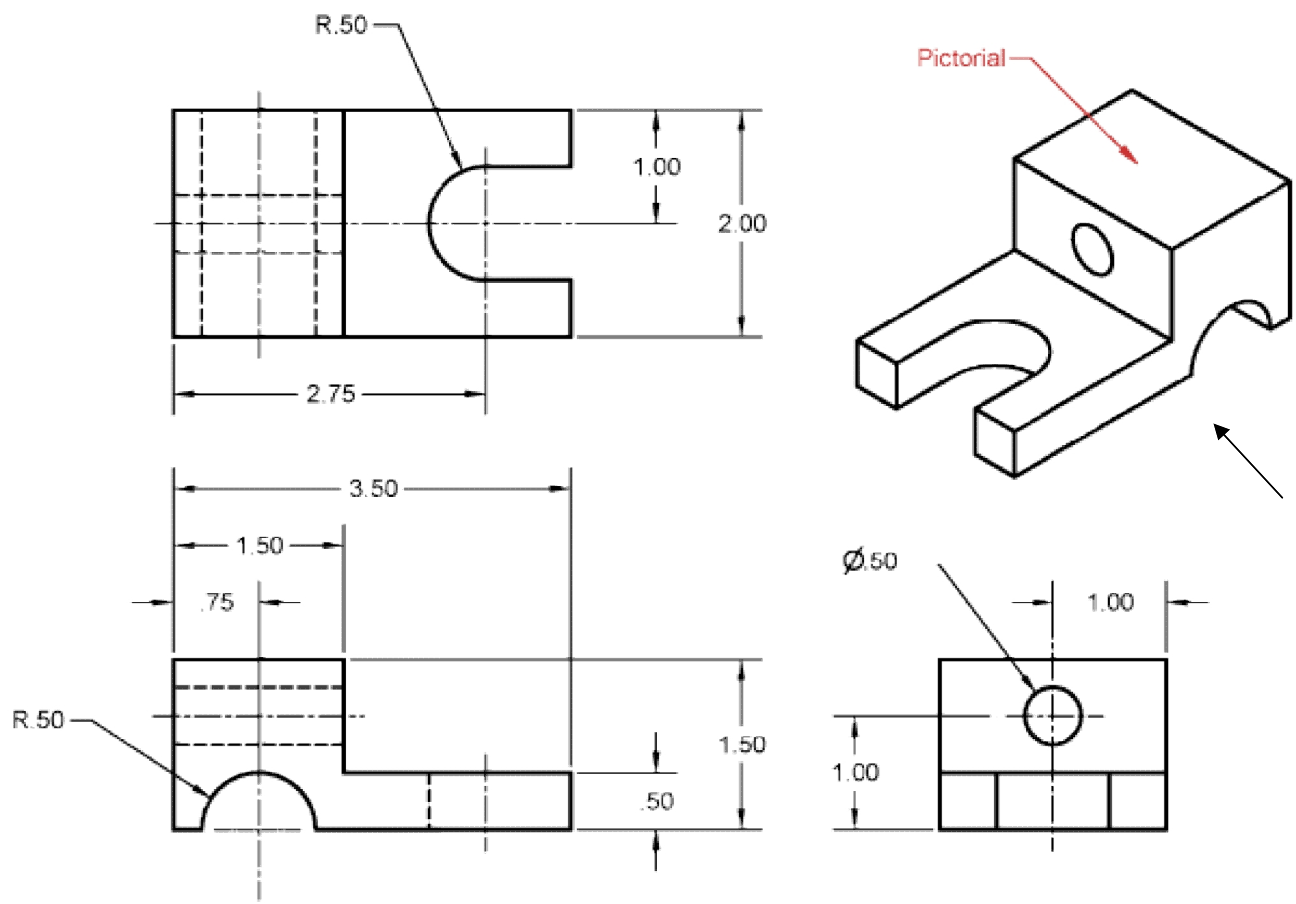
1. Place the paper in landscape mode, long dimension left and right.
2. Choose the front view, see the instructions for front view choice in the rules for making an orthographic projection.
3. Draw the front view in the lower left area of the paper. The Front View is our base view, with all other views aligned with the Front. Draw the Front View to scale using construction lines, object lines and making sure all lines are straight and neat.
4. Draw the TOP VIEW above the Front View. Extend the construction lines for the front view up to the area of the Top View. The left side of the top view should exactly line up with the left side of the front view. This also applies to the right side. Finish the Top View.
5. Draw the SIDE VIEW to the right of the Front View. Extend the construction lines of the top and bottom of the Front View to the right to the location of the Side View. Finish the Side View. We have choosen the Right View perspective to always be used for this class.
6. If needed, we could arrange the drawing to show other views such as the bottom, left side and possibly a section view. This is beyond the scope of the class.
7. If time allows, the student may elect to create an ISOMENTRIC VIEW. This is typically placed in the upper right corner. Reduced scale is acceptable if needed.
8. After the required views are complete, the student will then add extention lines and dimension lines. A dimension line has arrowheads at the end that touch the extension lines or the object line. Dimension lines show the actual size of the object. The inch symbol " is usually omitted for this type of drawing. If needed, leader lines would be added to include additional information such as diameters of holes, radius of a curve or other important notes for the fabricator.

9. The student will then proceed to add a border to the drawing using a thick solid line approx. 3/8 inches from the edge of the paper.
10. The student will add a title block to their drawing. This is typically in the lower right corner of the paper, touching the border line in this area. The Title Block would show the name of the Organization/Company, the name of the drawing, the person's name who prepared the drawing and possibly the date and revision.
11.To complete the drawing, any extranious marks such as unused construction lines would be erased.

Object No. 1



Object No. 2


R.50
Pictorial
1.00
2.00
2.75
3.50
1.50
.75
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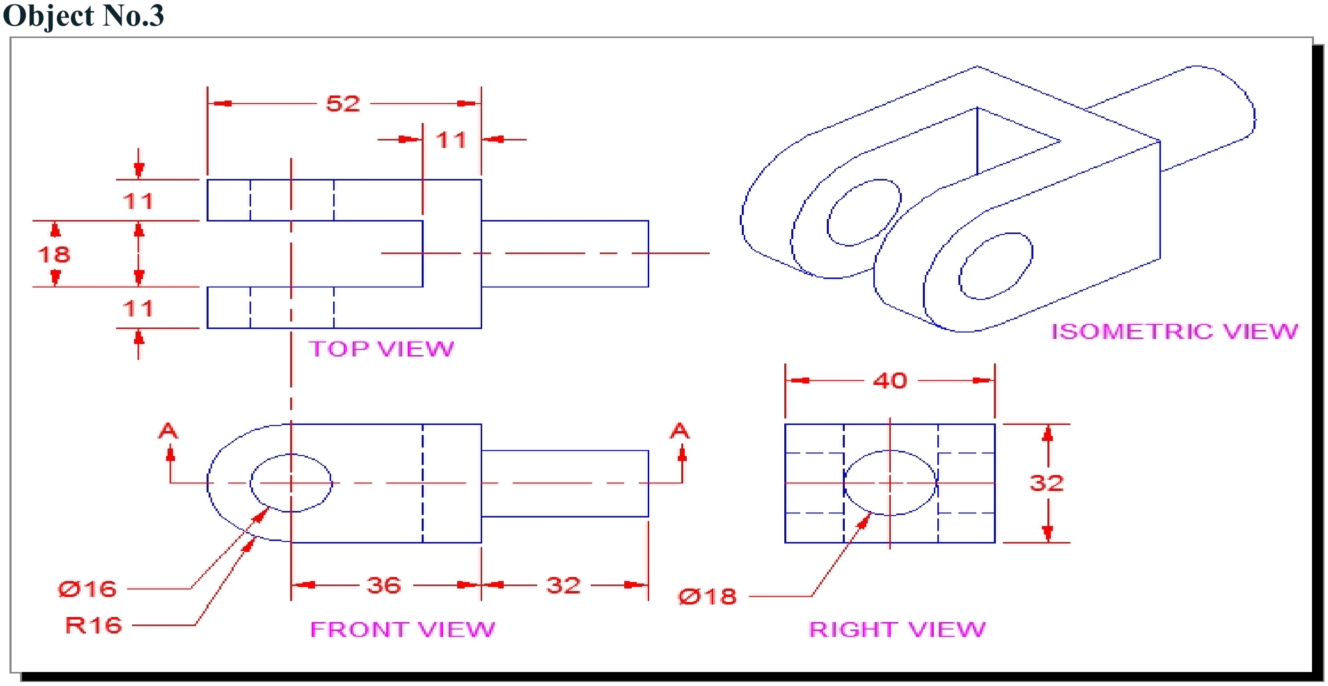
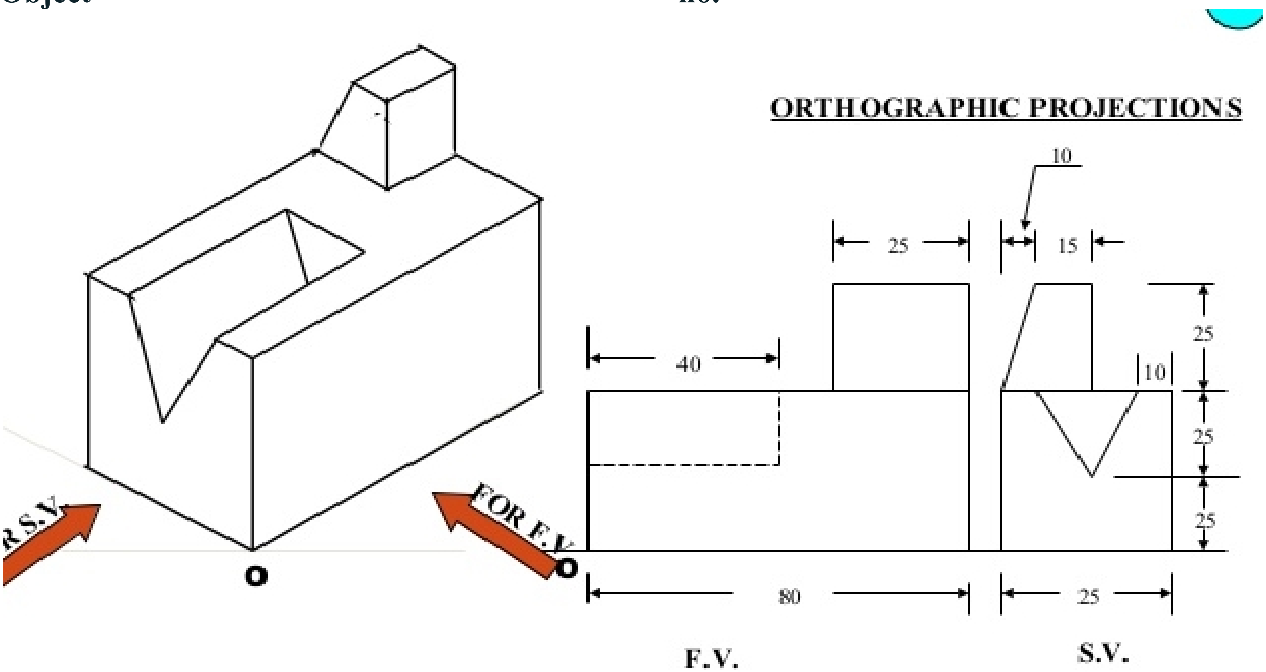
1.00

Object No.3


52
11
11
18
11
TOP VIEW
ISOMETRIC VIEW
40
A
A
32
Ø16
R16
36
32
Ø18
FRONT VIEW
RIGHT VIEW

Object no. 4



Experiment No. 5(a) PROJECTION OF LINES

AIM: Line AB is 75 mm long and it is 30^0 & 40^0 Inclined to Hp & Vp respectively.End A is 12mm above Hp and 10 mm in front of Vp. Draw projections. Line is in 1^{st} quadrant.

SOLUTION STEPS:

1) Draw xy line and one projector.

2) Locate a' 12mm above xy line & a 10mm below xy line.

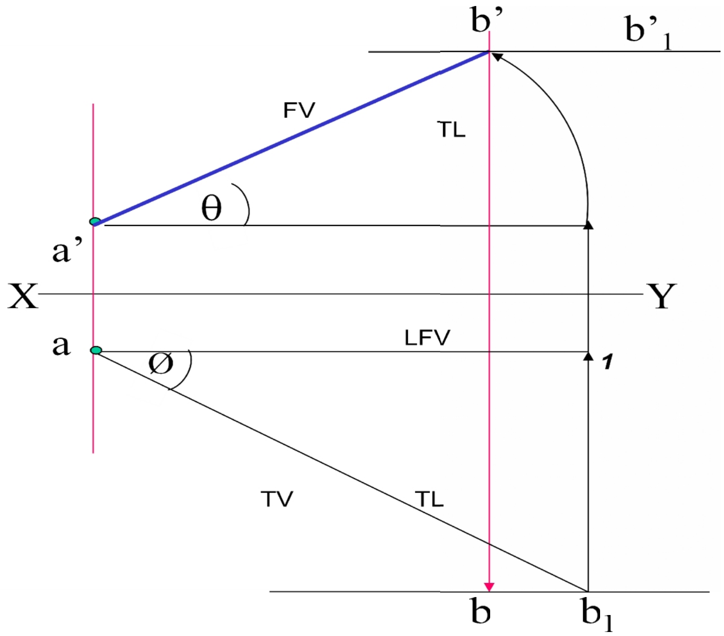
3) Take 30^0 angle from a' & 40^0 from a' and mark TL I.e. 75mm on both lines. Name those points b_1' and b_1 respectively.

4) Join both points with a' and a resp.

5) Draw horizontal lines (Locus) from both points.

6) Draw horizontal component of TL a b_1 from point b_1 and name it 1. (the length a-1 gives length of Fv as we have seen already.

7) Extend it up to locus of a' and rotating' a' as center locate b' as shown. Join a' b' as Fv.8) From b' drop a projector downward & get point b. Join a & b I.e. Tv.



Experiment No. 5(b) PROJECTION OF LINES

AIM: Line AB 75mm long makes 45^0 inclination with Vp while it's Fv makes 55^0.End A is 10 mm above Hp and 15 mm in front of Vp.If line is in 1^{st} quadrant draw it's projections and find it's inclination with Hp.

Solution Steps:-

1. Draw x-y line.

2. Draw one projector for a' & a

3. Locate *a'* 10mm above x-y & Tv *a* 15 mm below xy.

4. Draw a line 45^0 inclined to xy from point *a* and cut TL 75 mm on it and name that point b_1

   Draw locus from point b_1

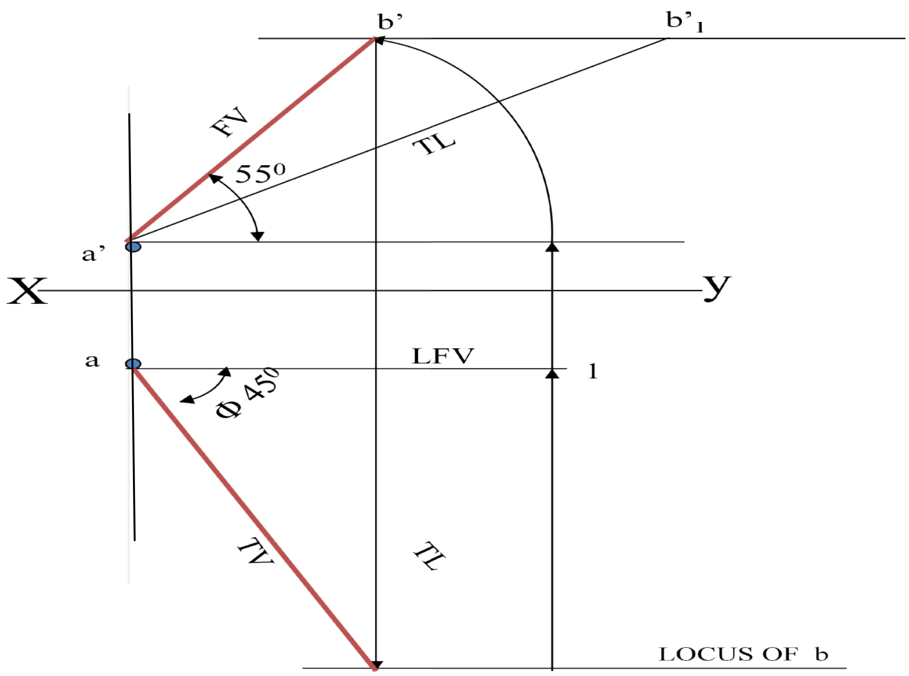
5.Take 55^0 angle from *a'* for Fv above xy line.

6. Draw a vertical line from b_1 up to locus of a and name it *1*.It is horizontal component of TL & is LFV.

7. Continue it to locus of *a'* and rotate upward up to the line of Fv and name it *b'*. This a' *b'* line is Fv.

8. Drop a projector from b' on locus from point b_1 and name intersecting point *b*. Line *a b* is Tv of line AB.

9. Draw locus from *b'* and from *a'* with TL distance cut point b_1'



Experiment No. 5(c) PROJECTION OF LINES

Aim: Fv of line AB is 50^0 inclined to xy and measures 55 mm long while it's Tv is 60^0 inclined to xy line. If end A is 10 mm above Hp and 15 mm in front of Vp, draw it's projections, find TL, inclinations of line with Hp & Vp.

SOLUTION STEPS:

1. Draw xy line and one projector.

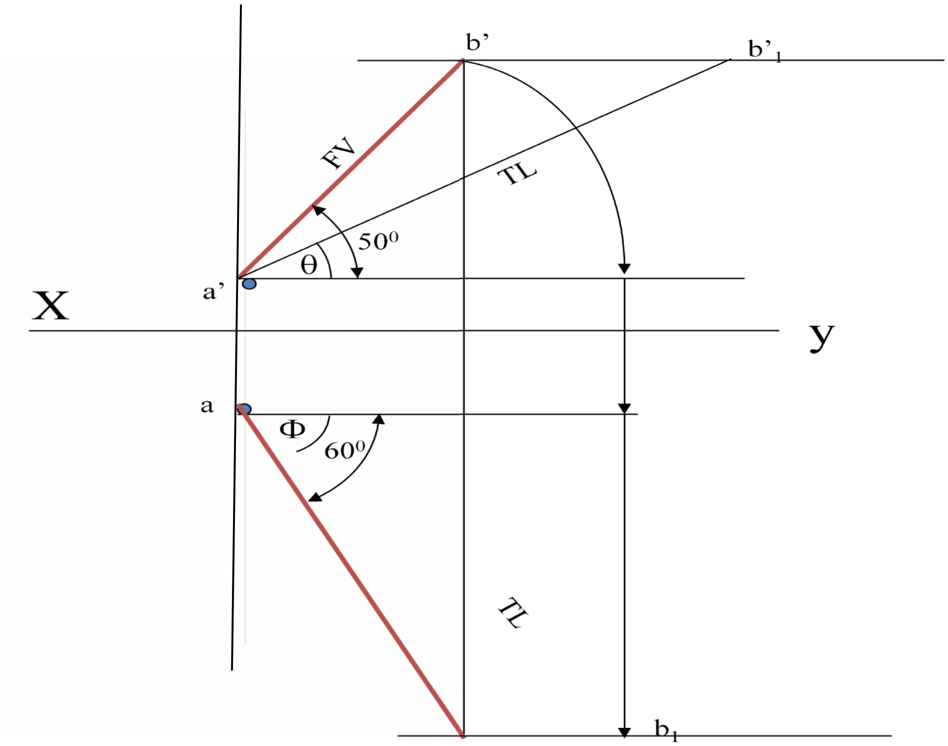
2.Locate a' 10 mm above xy and a 15 mm below xy line.

3. Draw locus from these points.

4. Draw Fv 50^0 to xy from a' and mark b' Cutting 55mm on it.

5. Similarly draw Tv 60^0 to xy from a & drawing projector from b' Locate point b and join a b.

6. Then rotating views as shown, locate True Lengths ab_1 & $a'b_1'$ and their angles with Hp and Vp.



Experiment No. 5(d) PROJECTION OF LINES

Aim: Line AB is 75 mm long .It's Fv and Tv measure 50 mm & 60 mm long respectively. End A is 10 mm above Hp and 15 mm in front of Vp. Draw projections of line AB if end B is in first quadrant. Find angle with Hp and Vp.

SOLUTION STEPS:

1. Draw xy line and one projector.

2. Locate a' 10 mm above xy and a 15 mm below xy line.

3. Draw locus from these points.

4. Cut 60mm distance on locus of a'& mark 1' on it as it is LTV.

5. Similarly Similarly cut 50mm on locus of a and mark point 1 as it is LFV.

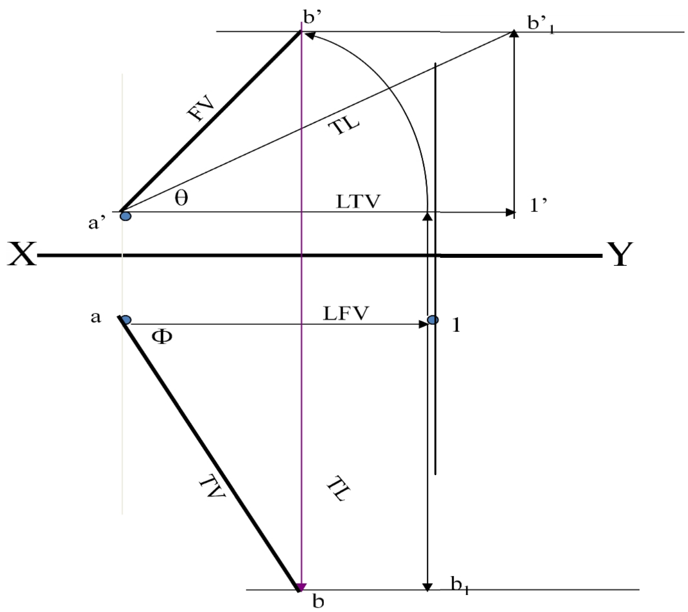
6. From 1' draw a vertical line upward and from a' taking TL (75mm) in compass, mark b'_1 point on it. Join a' b'_1 points.

7. Draw locus from b'_1

8. With same steps below get b_1 point and draw also locus from it.

9. Now rotating one of the components I.e. a-1 locate b' and join a' with it to get Fv.

10. Locate tv similarly and measure Angles.



Experiment No. 6(a) PROJECTION OF SURFACES OR PLANES

Aim : A rectangle 30mm and 50mm sides is resting on HP on one small side which is 30^0 inclined to VP, while the surface of the plane makes 45^0 inclination with HP. Draw it's projections.

PROCEDURE OF SOLVING THE PROBLEM:

STEP 1. Assume suitable conditions & draw Fv & Tv of initial position.

STEP 2. Now consider surface inclination & draw 2^{nd} Fv & Tv.

STEP 3. After this, consider side/edge inclination and draw 3^{rd} (final) Fv & Tv.

ASSUMPTIONS FOR INITIAL POSITION:

(Initial Position means assuming surface // to HP or VP)

1. If in problem surface is inclined to HP – assume it // HP Or If surface is inclined to VP – assume it // to VP

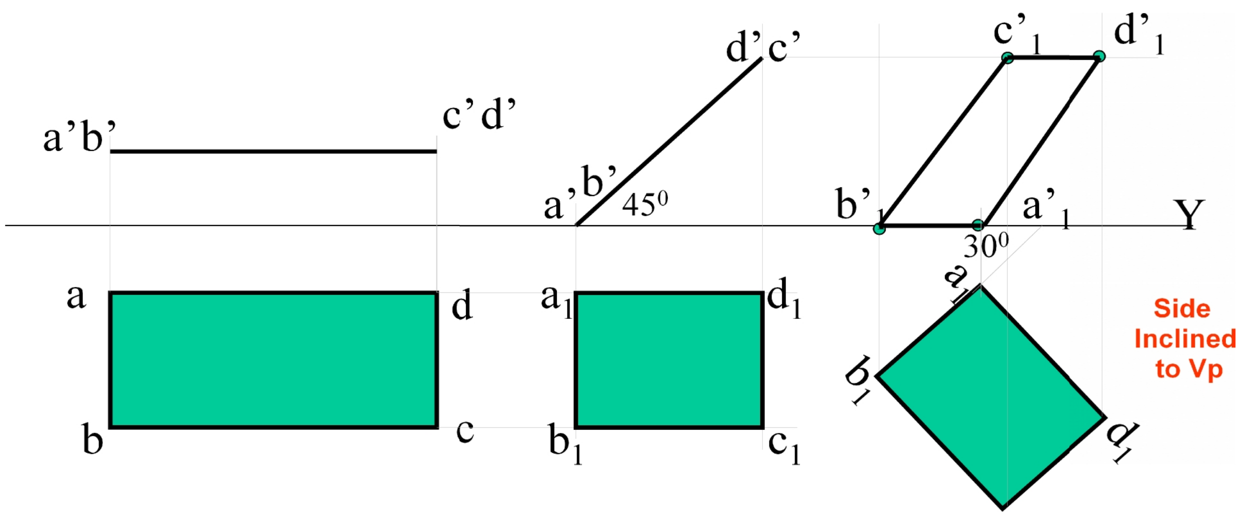
2. Now if surface is assumed // to HP- It's TV will show True Shape. And If surface is assumed // to VP – It's FV will show True Shape.

3. Hence begin drawing with TV or FV as True Shape.

4. While drawing this True Shape – keep one side/edge (which is making inclination) perpendicular to xy line .

Now Complete STEP 2. By making surface inclined to the resp. plane & project it's other view.

Now Complete STEP 3. By making side inclined to the resp. plane & project it's other view



Experiment No. 6(b) PROJECTION OF SURFACES & PLANES

Aim: A $30^0 - 60^0$ set square of longest side 100 mm long is in VP and 30^0 inclined to HP while it's surface is 45^0 inclined to VP. Draw it's projections

PROCEDURE OF SOLVING THE PROBLEM:

STEP 1. Assume suitable conditions & draw Fv & Tv of initial position.

STEP 2. Now consider surface inclination & draw 2nd Fv & Tv.

STEP 3. After this, consider side/edge inclination and draw 3rd (final) Fv & Tv.

ASSUMPTIONS FOR INITIAL POSITION:

(Initial Position means assuming surface // to HP or VP)

1. If in problem surface is inclined to HP – assume it // HP Or If surface is inclined to VP – assume it // to VP

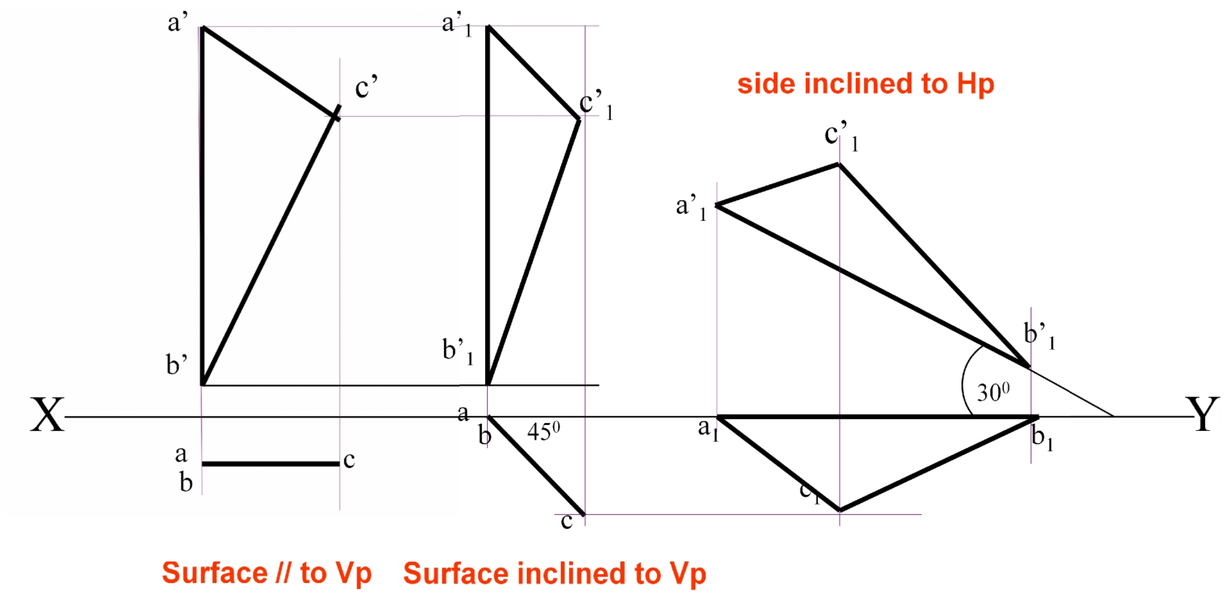
2. Now if surface is assumed // to HP- It's TV will show True Shape. And If surface is assumed // to VP – It's FV will show True Shape.

3. Hence begin drawing with TV or FV as True Shape.

4. While drawing this True Shape – keep one side/edge (which is making inclination) perpendicular to xy line.

Now Complete STEP 2. By making surface inclined to the resp. plane & project it's other view.

Now Complete STEP 3. By making side inclined to the resp. plane & project it's other view



Experiment No. 6(c) PROJECTION OF SURFACES & PLANES

Aim: A regular pentagon of 30 mm sides is resting on HP on one of it's sides with it's surface 45^0 inclined to HP. Draw it's projections when the side in HP makes 30^0 angle with VP.

PROCEDURE OF SOLVING THE PROBLEM:

STEP 1. Assume suitable conditions & draw Fv & Tv of initial position.

STEP 2. Now consider surface inclination & draw 2^{nd} Fv & Tv.

STEP 3. After this, consider side/edge inclination and draw 3^{rd} (final) Fv & Tv.

ASSUMPTIONS FOR INITIAL POSITION:

(Initial Position means assuming surface // to HP or VP)

1. If in problem surface is inclined to HP – assume it // HP or If surface is inclined to VP – assume it // to VP

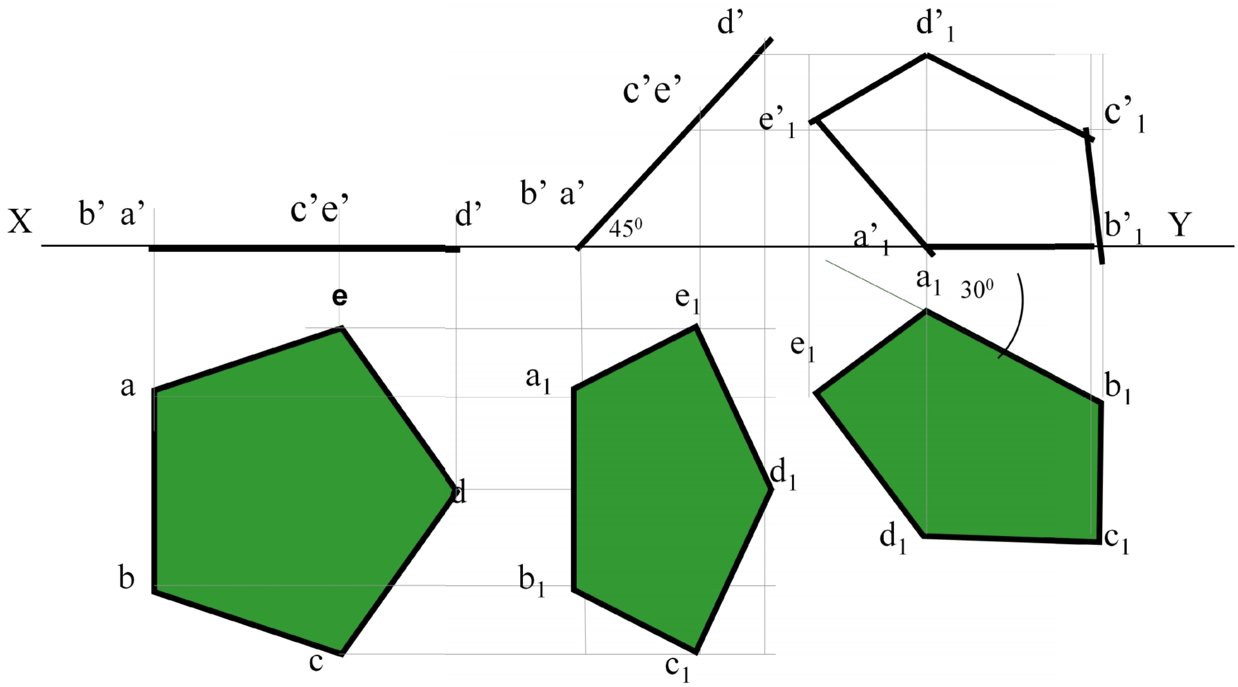
2. Now if surface is assumed // to HP- It's TV will show True Shape. And If surface is assumed // to VP – It's FV will show True Shape.

3. Hence begin drawing with TV or FV as True Shape.

4. While drawing this True Shape – keep one side/edge (which is making inclination) perpendicular to xy line.

Now Complete STEP 2. By making surface inclined to the resp. plane & project it's other view.

Now Complete STEP 3. By making side inclined to the resp. plane & project it's other view



Experiment No. 6(d) PROJECTION OF SURFACES & PLANES

Aim: A circle of 50 mm diameter is resting on Hp on end A of it's diameter AC which is 30^0 inclined to Hp while it's Tv is 45^0 inclined to Vp. Draw it's projections.

PROCEDURE OF SOLVING THE PROBLEM:

STEP 1. Assume suitable conditions & draw Fv & Tv of initial position.

STEP 2. Now consider surface inclination & draw 2^{nd} Fv & Tv.

STEP 3. After this, consider side/edge inclination and draw 3^{rd} (final) Fv & Tv.

ASSUMPTIONS FOR INITIAL POSITION:

(Initial Position means assuming surface // to HP or VP)

1. If in problem surface is inclined to HP – assume it // HP Or If surface is inclined to VP – assume it // to VP

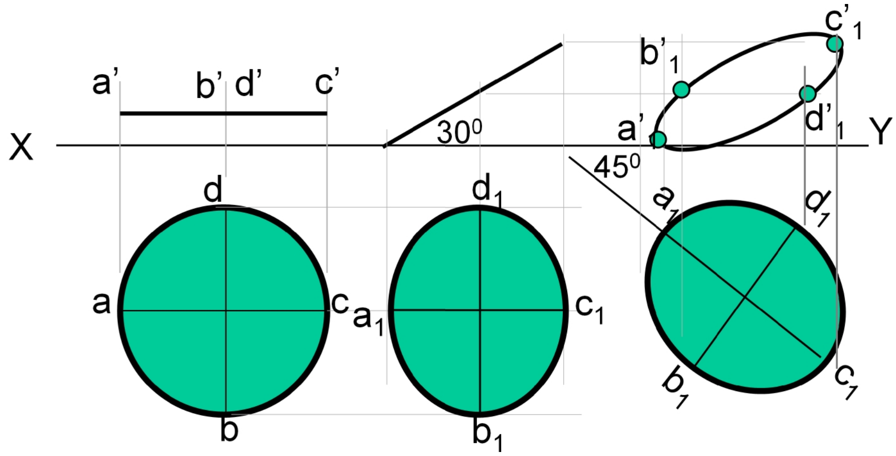
2. Now if surface is assumed // to HP- It's TV will show True Shape. And If surface is assumed // to VP – It's FV will show True Shape.

3. Hence begin drawing with TV or FV as True Shape.

4. While drawing this True Shape – keep one side/edge (which is making inclination) perpendicular to xy line.

Now Complete STEP 2. By making surface inclined to the resp. plane & project it's other view.

Now Complete STEP 3. By making side inclined to the resp. plane & project it's other view



Experiment No. 7(a) PROJECTION OF SOLIDS

Aim: A square pyramid, 40 mm base sides and axis 60 mm long, has a triangular face on the ground and the vertical plane containing the axis makes an angle of 45^0 with the VP. Draw its projections. Take apex nearer to VP.

Solution Steps:

Triangular face on Hp means it is lying on Hp:

1. Assume it standing on Hp.

2. It's Tv will show True Shape of base(square)

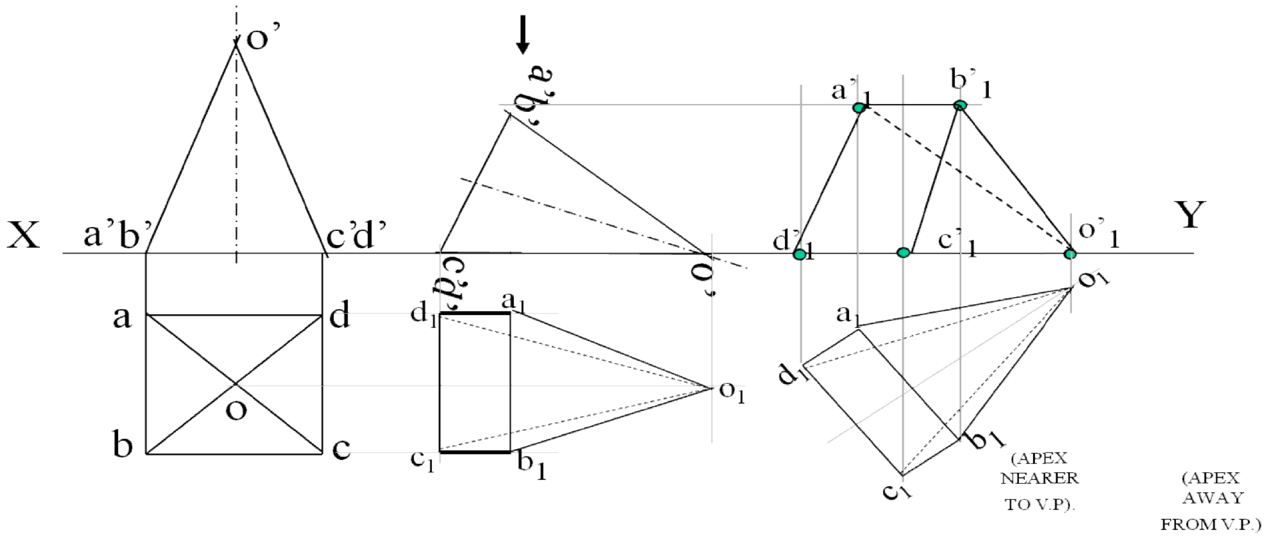
3. Draw square of 40mm sides with one side vertical Tv & taking 50 mm axis project Fv. (a triangle)

4. Name all points as shown in illustration.

5. Draw 2^{nd} Fv in lying position I.e.o'c'd' face on xy. And project it's Tv.

6. Make visible lines dark and hidden dotted, as per the procedure.

7. Then construct remaining inclination with Vp (Vp containing axis ic the center line of 2^{nd} Tv. Make it 45^0 to xy as shown take apex near to xy, as it is nearer to Vp) & project final Fv.



Experiment No. 7(b) PROJECTION OF SOLIDS

Aim: A cone 40 mm diameter and 50 mm axis is resting on one generator on Hp which makes 30^0 inclination with Vp Draw it's projections.

Solution Steps:

Resting on Hp on one generator, means lying on Hp:

1. Assume it standing on Hp.

2. It's Tv will show True Shape of base(circle)

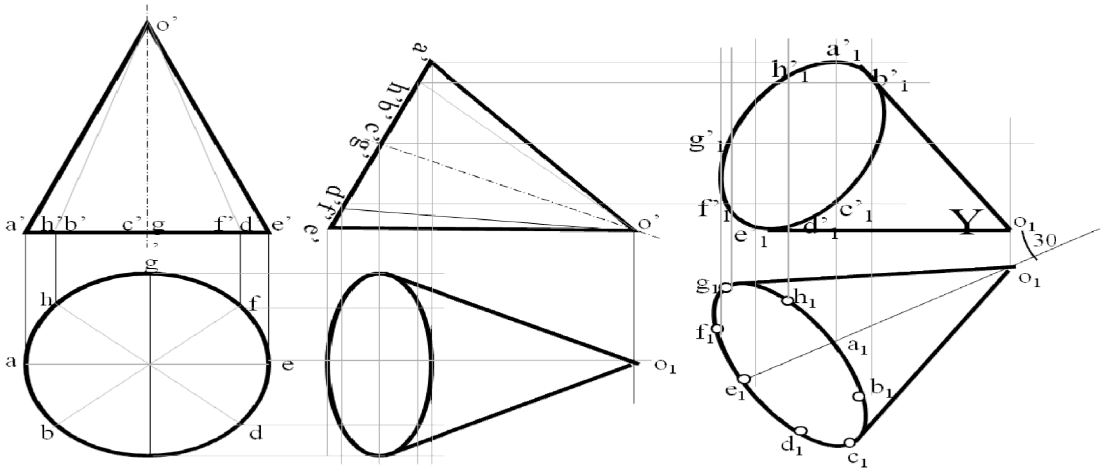
3. Draw 40mm dia. Circle as Tv & taking 50 mm axis project Fv. (a triangle)

4. Name all points as shown in illustration.

5. Draw 2^{nd} Fv in lying position I.e.o'e' on xy. And project it's Tv below xy.

6. Make visible lines dark and hidden dotted, as per the procedure.

7. Then construct remaining inclination with Vp. (generator o_1e_1 30^0 to xy as shown) & project final Fv.



Experiment No. 7(c) PROJECTION OF SOLIDS

Aim:A cylinder 40 mm diameter and 50 mm axis is resting on one point of a base circle on Vp while it's axis makes 45^0 with Vp and Fv of the axis 35^0 with Hp. Draw projections.

Solution Steps:

Resting on Vp on one point of base, means inclined to Vp:

1. Assume it standing on Vp

2. It's Fv will show True Shape of base & top(circle)

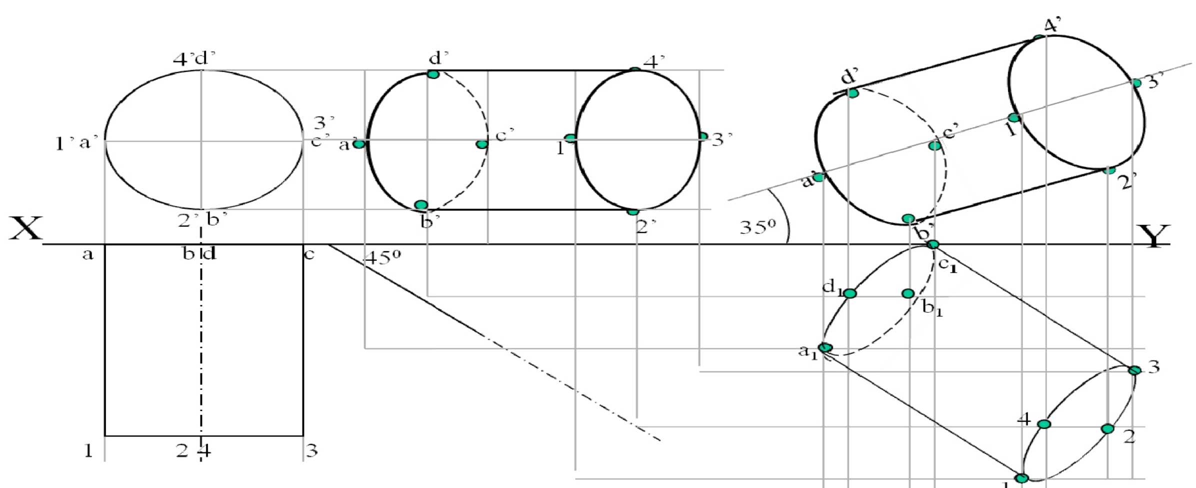
3. Draw 40mm dia. Circle as Fv & taking 50 mm axis project Tv. (a Rectangle)

4. Name all points as shown in illustration.

5. Draw 2^{nd} Tv making axis 45^0 to xy And project it's Fv above xy.

6. Make visible lines dark and hidden dotted, as per the procedure.

7. Then construct remaining inclination with Hp (Fv of axis I.e. center line of view to xy as shown) & project final Tv.



Experiment No. 7(d) PROJECTION OF SOLIDS

Aim: A cube of 50 mm long edges is so placed on Hp on one corner that a body diagonal is parallel to Hp and perpendicular to Vp Draw it's projections.

Solution Steps:

1. Assuming standing on Hp, begin with Tv,a square with all sides equally inclined to xy.Project Fv and name all points of FV & TV.

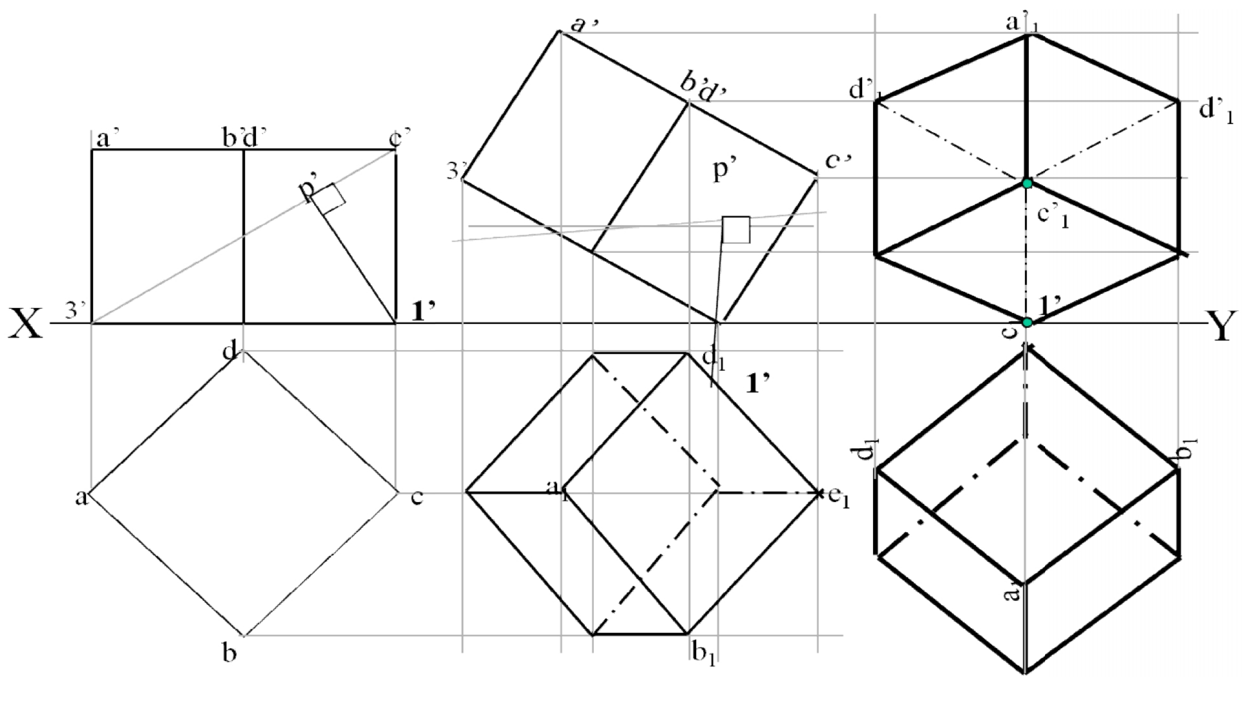
2. Draw a body-diagonal joining c' with 3'(This can become // to xy)

3. From 1' drop a perpendicular on this and name it p'

4. Draw 2nd Fv in which 1'-p' line is vertical ***means*** c'-3' diagonal must be horizontal.

5. Now as usual project Tv.

6. In final Tv draw same diagonal is perpendicular to Vp as said in problem. Then as usual project final FV.



Experiment No. 8 SECTION OF SOLIDS & DEVELOPMENT OF SURFACES

Aim: Draw the isometric projection of the given objects.

STEPS IN CONSTRUCTING AN ISOMETRIC DRAWING

STEP 1 Draw the three axes using triangles as light as possible. Be sure the cross axes are about 30° from the lower edge of the paper.

STEP 2 Plot the principal dimensions, Height (H) on the vertical axis, Width (W) on the left 30° axis, and Depth (D) on the right 30° axis. Get the measurements from the orthographic views.

STEP 3 Draw the "box" or the crate lines. Use light lines only.

STEP 4 Draw the details of the object by analyzing the figure and determining the points in relation to other points representing the corners, surfaces, and edges.

STEP 5 Check the accuracy of your drawing.

STEP 6 Trace the visible edges with heavier lines.

STEP 7 Label the isometric view.

POINTS TO REMEMBER WHEN MAKING ISOMETRIC DRAWINGS

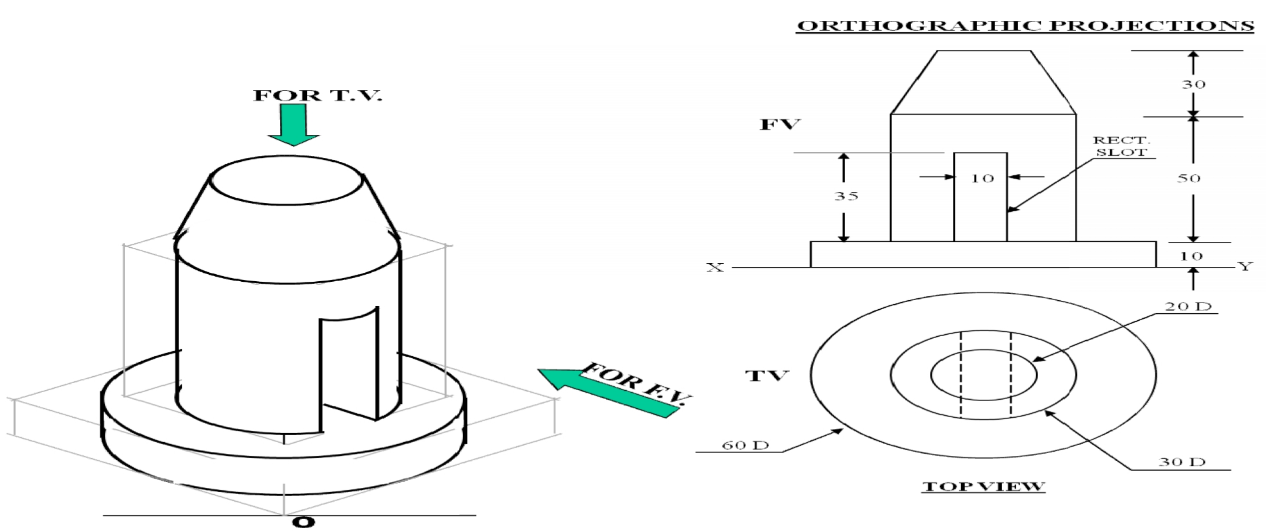
POINT 1 In drawing your isometric axes, they must be equally distanced at 120°.

POINT 2 All isometric lines must be parallel to the isometric axes.

POINT 3 Locate first the outstanding edges, corners, and surfaces before analyzing the figure.

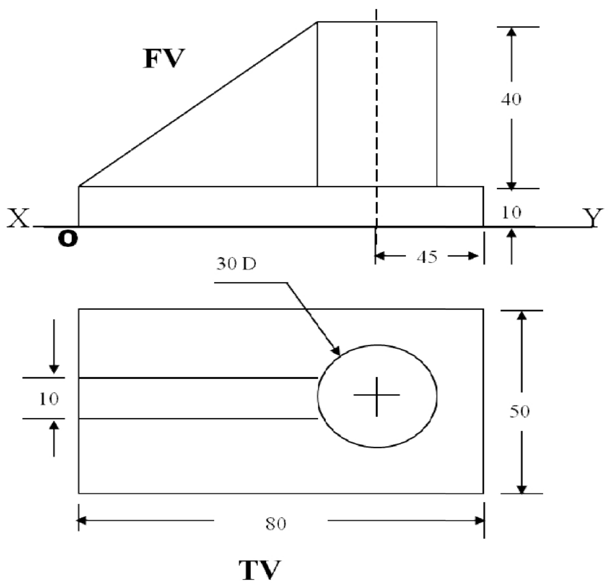
POINT 4 Use Light lines in sketching the details.

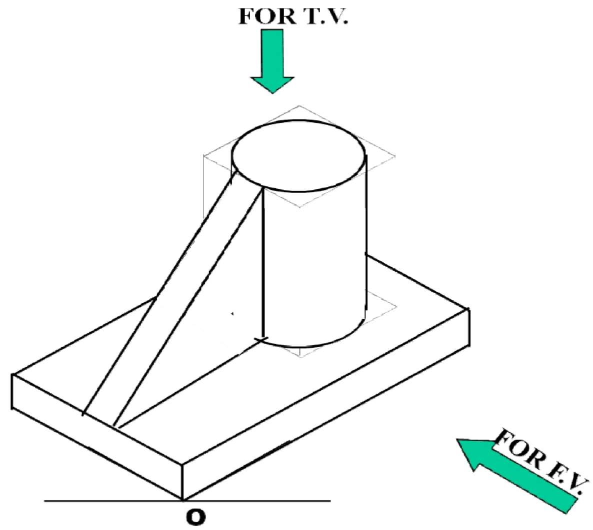
Object No. 1



Object No. 2

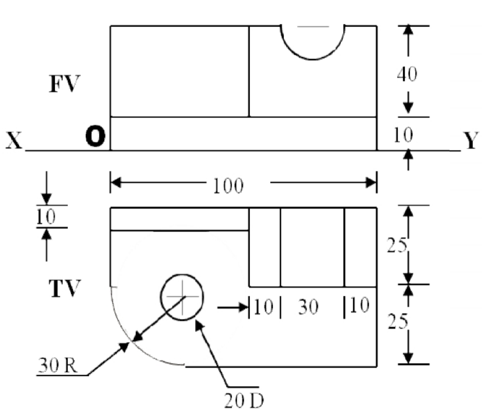
ORTHOGRAPHIC PROJECTIONS

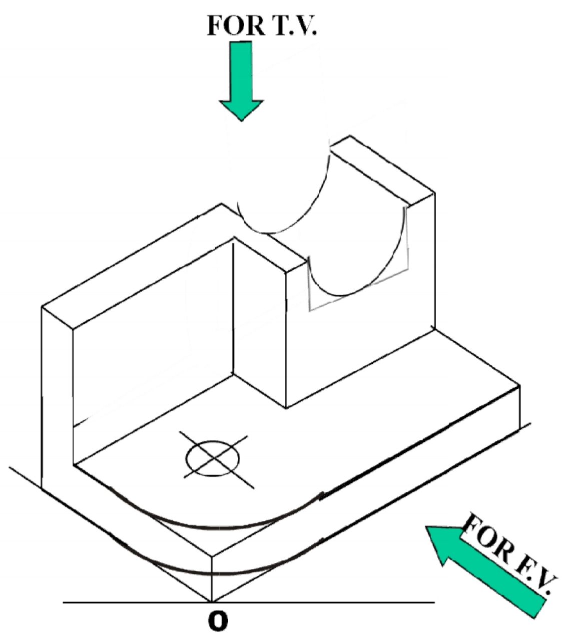




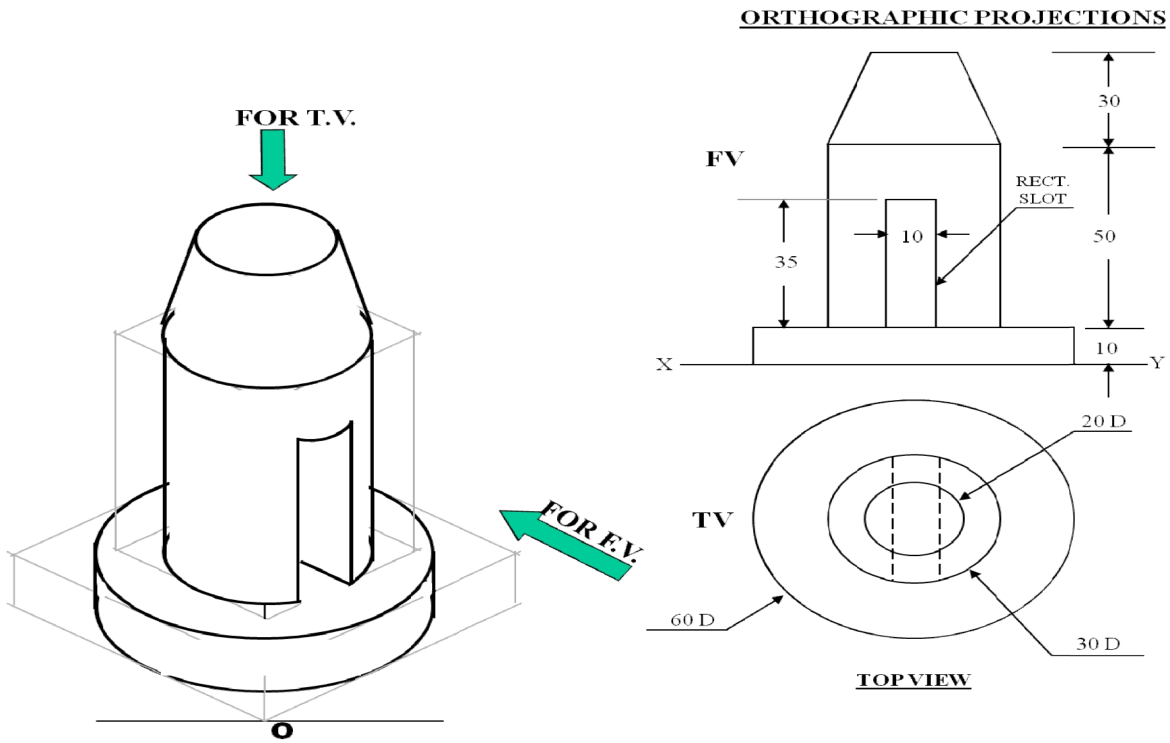
Object No. 3

ORTHOGRAPHIC PROJECTIONS





Object No. 4



Experiment No. 9(a) SECTION OF SOLIDS & DEVELOPMENT OF SURFACES

Aim: A pentagonal prism, 30 mm base side & 50 mm axis is standing on Hp on it's base whose one side is perpendicular to Vp. It is cut by a section plane 45^0 inclined to Hp, through mid point of axis. Draw Fv, sec. Tv & sec. Side view. Also draw true shape of section and Development of surface of remaining solid.

Solution Steps:

For sectional views:

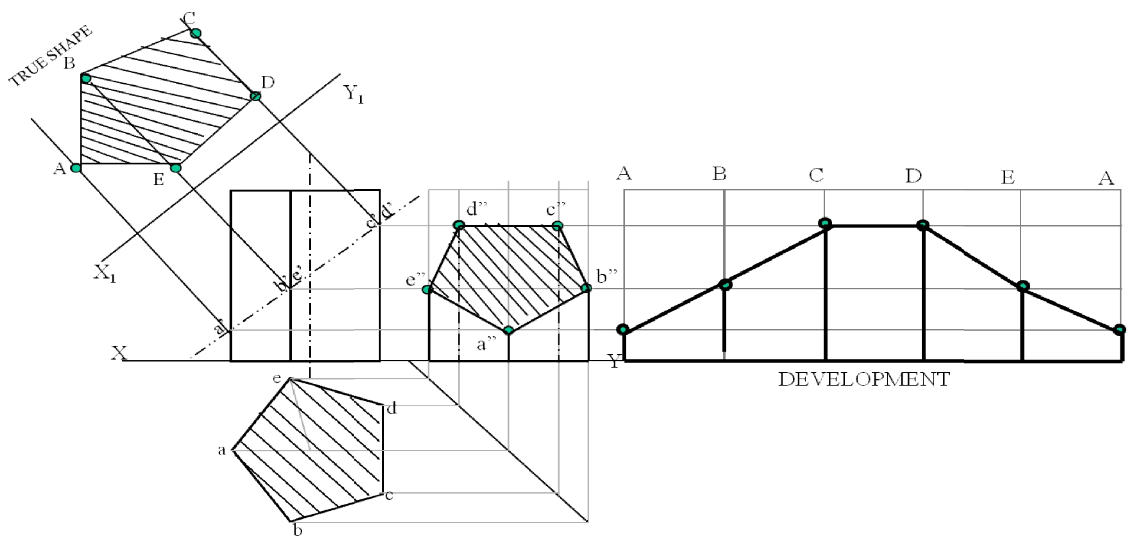
- Draw three views of standing prism.
- Locate sec. plane in Fv as described.
- Project points where edges are getting cut on Tv & Sv as shown in illustration.
- Join those points in sequence and show Section lines in it.
- Make remaining part of solid dark.

For True Shape:

- Draw x_1y_1 // to sec. plane
- Draw projectors on it from cut points.
- Mark distances of points of Sectioned part from Tv, on above projectors from x_1y_1 and join in sequence.
- Draw section lines in it.
- It is required true shape.

For Development:

- Cut-open edge I.e. A. in sequence as shown.
- Mark the cut points on respective edges.
- Join them in sequence in st. lines.
- Make existing parts dev. dark.



Experiment No. 9(b) SECTION OF SOLIDS & DEVELOPMENT OF SURFACES

Aim: A cone, 50 mm base diameter and 70 mm axis is standing on it's base on Hp. It cut by a section plane 45^0 inclined to Hp through base end of end generator. Draw projections, sectional views, true shape of section and development of surfaces of remaining solid.

Solution Steps:

For sectional views:

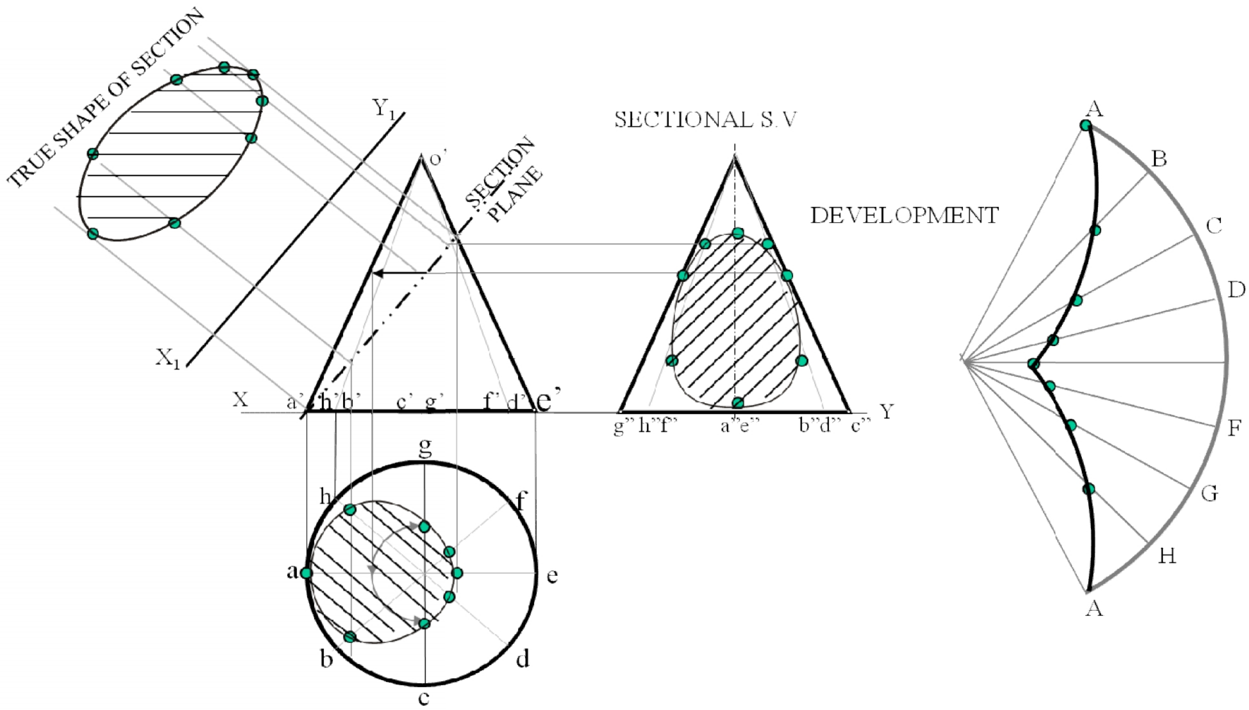
- Draw three views of standing cone.
- Locate sec. plane in Fv as described.
- Project points where generators are getting cut on Tv & Sv as shown in illustration. Join those points in sequence and show Section lines in it.
- Make remaining part of solid dark.

For True Shape:

- Draw x_1y_1 // to sec. plane
- Draw projectors on it from cut points.
- Mark distances of points of Sectioned part from Tv, on above projectors from x_1y_1 and join in sequence.
- Draw section lines in it.
- It is required true shape.

For Development:

- Draw development of entire solid.
- Name from cut-open edge i.e. A. in sequence as shown.
- Mark the cut points on respective edges.
- Join them in sequence in curvature.
- Make existing parts dev. dark.



UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR
Lab Manual

Title of Course: Basic Computation & Principles of Computer Programming-I Lab
Course Code: CS191
L-T-P scheme: 0-0-3 **Course Credit: 2**

Introduction:
This course is designed to familiarize students with the basic components of a computer, so as to be able to operate it and be able to interact with it, and carry out simple tasks. In addition, it will initiate the students into the discipline of Programming. It aims to start off the development of problem solving ability using computer programming. This course teaches not only the mechanics of programming, but also how to create programs that are easy to read, maintain, and debug. Students are introduced to the design principles for writing good programs regardless of the hardware and the software platforms.

Objective:
Students will develop their ability to design, develop, test and document structured programs in C language.

Learning Outcomes: Students should be able to
1. Understand the basic terminology used in computer programming
2. Write, compile and debug programs in C language.
3. Use different data types in a computer program.
4. Design programs involving decision structures, loops and functions.
5. Explain the difference between call by value and call by reference
6. Understand the dynamics of memory by the use of pointers.
7. Enhance programming skills through problem solving and code development of small-size software applications.
8. Improve self-learning, teamwork and communication skills through project development practices.
9. Engage in continuing professional development under minimal guidance.

Course Contents:
Exercises that must be done in this course are listed below:
1 Introduction to C programming
2 Structured Program Development in C
3 Flowchart and Algorithm
4 C Program Control
5 C Functions
6 C Arrays
7 C Pointers
8 C Characters and Strings
9 C Structures, Unions, Bit Manipulations and Enumerations
10 C File Processing

UNIVERSITY OF ENGINEERING AND MANAGEMENT, JAIPUR

Lab Manual

CYCLE – I

1. Write a program to evaluate area of triangle using the formula sqrt(s(s-a)(s-b)(s-c))
2. Write a program to swap two numbers.
3. Write a program to find the greatest of three numbers and print the numbers in ascending order.
4. Write a program to perform the arithmetic expression using switch statement.
5. Write a program to find a factorial of given number using do while statement.
6. Write a program to print all prime numbers upto 'N' numbers.
7. Write a program to print sum of 'N' natural numbers.
8. Write a program to find the total number of even integers and odd integers of 'N' numbers.
9. Write a program to find the sum of odd numbers and even numbers upto 'N' numbers.
10. Write a program to print the product of two matrices of any order.
11. Write a program to read 'N' number of students with 5 subject marks.
12. Write a program to find greatest of 'n' numbers using functions.
13. Write a program to print Fibonacci series using recursion.
14. Write a program to convert all lower case to uppercase characters.
15. Write a program to sort 5 city names in alphabetical order.

CYCLE II

16. Write a program to extract a string.
17. Write a program to implement the concept of call by value.
18. Write a program to implement the concept of call by reference.
19. Write a program to implement the concept of structure and union.
20. Write a program to access a variable using pointer.
21. Write a program to print the element of array using pointers.
22. Write a program to print the elements of a structure using pointers.
23. Write a program to display student information by initializing structures.
24. Write a program to pass structure as arguments to function and calculate total marks of 5 subjects.
25. Write a program to write integer data into file and read it from file.

Ex. No. 1 **AREA OF TRIANGLE**

AIM:

To write a program for evaluating the area of triangle using the formula sqrt(s(s-a)(s-b)(s-c)).

ALGORITHM:

Step1: Start the program.

Step2: Get the inputs a, r, t and s.

Step3: Calculate s = (a+b+c) / 2.

Step4: Calculate area=sqrt(s*(s-a)*(s-b)*(s-c)).

Step 5: Print the result ‘area’.

Step 6: Stop the program.

PROGRAM:

```
#include<stdio.h>
#include<math.h>
void main()
{
   int a,b,c;
   float s,area;
   clrscr();
   printf("Enter the values of a,b,c: ");
   scanf("%d%d%d",&a,&b,&c);
   s=(a+b+c)/2;
   area=sqrt(s*(s-a)*(s-b)*(s-c));
   printf("The area of a triangle is =%f",area);
   getch();
}
```

OUTPUT:

Enter the values of a,b,c: 10 20 30

The area of a triangle is = 0.000000

RESULT:

Thus the C program to find the area of triangle using the formula sqrt(s(s-a)(s-b)(s-c)) has been successfully executed and verified.

Ex. No. 2 **SWAP TWO NUMBERS**

AIM:

To write a program for swapping of two numbers.

ALGORITHM:

Step1: Start the program.

Step2: Get the inputs a and b.

Step3: Find a=a+b.

Step4: Find b=a-b.

Step 5: Find a=a-b.

Step6: Print the result 'a' and 'b'.

Step7: Stop the program.

PROGRAM:

```
#include<stdio.h>
#include<conio.h>
void main()
{
  int a,b;
  clrscr();
  printf("Enter the values of a and b: ");
  scanf("%d%d",&a,&b);
  a=a+b;
  b=a-b;
  a=a-b;
  printf("The values of a and b are: %d %d", a, b);
  getch();
}
```

OUTPUT:

Enter the values of a and b: 10 20

The values of a and b are: 20 10

RESULT:

Thus the C program to swap two numbers has been successfully executed and verified.

Ex. No. 3 GREATEST OF THREE NUMBERS AND PRINT ASCENDING ORDER AIM:

To write a program for finding the greatest of three numbers and printing the numbers in ascending order.

ALGORITHM:

Step1: Start the program.

Step2: Get the inputs a, b and c.

Step3: Check if((a>b) &&(a>c))

Step4: Again check if(b>c)

Step5: Then print the greatest number and display a, b, c.

Step6: Else print the greatest number and display a, c, b.

Step7: Check if((b<c) &&(b<a))

Step8: Again check if(c<a)

Step9: Then print the greatest number and display b, c, a.

Step10: Else print the greatest number and display b, a, c.

Step11: Check if((c<a) && (c<b))

Step12: Again check if(a<b)

Step13: Then print the greatest number and display c, a, b.

Step14: Else print the greatest number and display c, b, a.

Step15: Stop the program.

PROGRAM:

```
#include<stdio.h>
#include<conio.h>
void main()
{
int a,b,c;
clrscr();
printf("Enter the values of a, b and c: ");
scanf("%d%d%d", &a, &b, &c);
if(a<b && a<c)
{
        if(b<c)
```

```
                {
                        printf("The greatest number is: %d", a);
                        printf("The ascending order: %d%d%d", a, b, c);
                }
        else
                if(b>c)
                {
                        printf("The greatest number is: %d", a);
                        printf("The ascending order: %d%d%d", a, c, b);
                }
}
else if(b<c && b<a)
        {
                if(c<a)
                {
                        printf("The greatest number is: %d", b);
                        printf("The ascending order: %d%d%d", b, c, a);
                }
        else
                {
                        printf("The greatest number is: %d", b);
                        printf("The ascending order: %d%d%d", b, a, c);
                }
        }
else
        if(b<a)
        {
                printf("The greatest number is: %d", c);
                printf("The ascending order: %d%d%d", c, b, a);
        }
        else
                {
                        printf("The greatest number is: %d", c);
                        printf(The ascending order: %d%d%d", c, a, b);
                }
}
```

OUTPUT: Enter the values of a, b and c: 6 4 5

The greatest number is: 6
The ascending order: 4 5 6

RESULT:

Thus the C program to find greatest of three and to print the numbers in ascending order has been successfully executed and verified.

Ex. No. 4 ARITHMETIC EXPRESSION USING SWITCH STATEMENT

AIM:

To write a program for performing the arithmetic expression using switch statement.

ALGORITHM:

Step1: Start the program.
Step2: Display 1. Addition 2. Subtraction 3. Multiplication and 4. Division
Step3: Get the input a and b.
Step4: Get the choice.
Step5: Switch(result)
Step6: case '+': print the sum of a & b.
Step7: case '-': print the difference of a & b.
Step8: case '*': print the multiplication of a & b.
Step9: case '/': print the division of a & b.
Step10: default: invalid option.
Step11: Stop the program.

PROGRAM:

```
#include<stdio.h>
#include<conio.h>
void main()
{
int a,b;
int op;
clrscr();
printf("Enter the values of a & b: ");
scanf("%d%d", &a, &b);
printf(" 1.Addition\n 2.Subtraction\n 3.Multiplication\n 4.Division\n");
printf("Enter your choice: ");
scanf("%d", &op);
switch(op)
  {
        case 1 :printf("Sum of %d and %d=%d", a, b, a+b);
        break;
        case 2 :printf("Subtraction of %d and %d=%d", a, b, a-b);
        break;
        case 3 :printf("Multiplication of %d and %d=%d", a, b, a*b);
        break;
        case 4 :printf("Division of %d and %d=%d", a, b, a/b);
        break;
        default : printf(" Enter Your Correct Choice.");
        break;
```

```
  }
getch();
}
```

OUTPUT:

Enter the values of a & b: 10 20

1. Addition
2. Subtraction
3. Multiplication
4. Division

Enter your choice: 1

Sum of 10 and 20 = 30

RESULT:

Thus the C program for arithmetic expression using switch statement has been successfully executed and verified.

Ex. No. 5 **FACTORIAL OF A NUMBER USING DO WHILE STATEMENT**

AIM:

To write a program for finding the factorial of a given number using do while statement.

ALGORITHM:

Step1: Start the program.
Step2: Assign f=i=1.
Step3: Get the input n.
Step4: do .. the following.
Step5: Find f=f*i
Step6: Increment i=i+1
Step7: Repeat from step5 to step6 till while(i<=no).
Step8: Then print f.
Step9: Stop the program.

PROGRAM:

```
#include<stdio.h>
#include<conio.h>
void main()
{
        int n,i,f;
        f=i=1;
        clrscr();
        printf("Enter a number: ");
        scanf("%d",&n);
        do
         {
                fact*=i;
                i++;
         }while(i<=no);
        printf("Factorial of %d=%d\n", no, fact;
}
```

OUTPUT:

Enter a number: 5

Factorial of 5 = 120

RESULT:

Thus the C program for finding the factorial of a given number using do while statement has been successfully executed and verified.

Ex. No. 6 **GENERATE PRIME NUMBERS UPTO N NUMBERS**

AIM: To write a program for printing all prime numbers upto N numbers.

ALGORITHM:

Step1: Start the program.
Step2: Get the n value.
Step3: for(i=1;i<=n;i++)
Step4: Repeat a, b, c, d & e
  a) Assign fact=0
  b) for(j=1;j<=n;j++) repeat c & d
  c) if i percentage j equal to zero
  d) fact equal to fact added with one
  e) if fact equal to 2 print i as prime number
Step5: Display the prime number till n^{th} number.
Step6: Stop the program.

PROGRAM:

```
#include<stdio.h>
#include<conio.h>
void main()
{
        int n,i,fact,j;
        printf("Enter the range: ");
        scanf("%d",&n);
        printf("Prime numbers are: \n");
        for(i=1;i<=n;i++)
        {
                fact=0;
                for(j=1;j<=n;j++)
                {
                if(i%j==0)
                fact++;
                if(f==2)
                printf("%d ",i);
                }
          getch();
        }
}
```

OUTPUT:

Enter the range: 10
Prime numbers are: 3 5 7

RESULT:

Thus the C program for printing all prime numbers upto N numbers has been successfully executed and verified.

Ex. No. 7 **SUM OF N NATURAL NUMBERS**

AIM:

To write a program for printing the sum of N natural numbers.

ALGORITHM:

Step1: Start the program.
Step2: Get the n value.
Step3: Initialize i=0 and sum=0.
Step4: Perform from step 5 to step 6 until i<=n
Step5: i++
Step6: sum+=i
Step7: Print the sum.
Step9: Stop the program.

PROGRAM:

```
#include<stdio.h>
#include<conio.h>
void main()
{
  int n,i=0,sum=0;
  clrscr( );
  printf("Enter the Limit : ");
  scanf("%d",&n);
  while(i<=n)
          {
            i++;
            sum+=i;
          }
  printf("Sum of %d natural numbers = %d",n,sum);
  getch();
}
```

OUTPUT:

Enter the Limit : 10

Sum of 10 natural numbers = 55

RESULT:

Thus the C program for printing the sum of N natural numbers has been successfully executed and verified.

Ex. No. 8 TOTAL NUMBER OF EVEN INTEGERS AND ODD INTEGERS OF 'N' NUMBERS

AIM: To write a program for finding the total number of even integers and odd integers of 'N' numbers.

ALGORITHM:

Step1: Start the program.
Step2: Declare int i, n, odd=0 and even=0;
Step3: Get the n value
Step4: for(i=0;i<=n;i++) do the following step.
 a) Check if(i%2==0)
 b) even=even+1;
 c) Else odd=odd+1;
Step5: Print the odd and even value.
Step6: Stop the program.

PROGRAM:

```
#include<stdio.h>
#include<conio.h>
void main()
{
  int n,i,odd=0,even=0;
  clrscr();
  printf("Enter the n value: ");
  scanf("%d",&n);
  for(i=1;i<n;i++)
   {
     if(i%2==0)
     even=even+1;
     else
     odd=odd+1;
    }
  prinf("The total number of odd integers =%d",odd);
  prinf("The total number of even integers =%d",even);
  getch();
 }
```

OUTPUT:

```
Enter the n value: 10
The total number of odd integers =5
The total number of even integers = 5
```

RESULT:

Thus the above C program for finding the total number of even integers and odd integers of 'N' numbers has been successfully executed and verified.

Ex. No. 9 SUM OF EVEN INTEGERS AND ODD INTEGERS OF ‘N’ NUMBERS AIM:

To write a program for finding the sum of even integers and odd integers of ‘N’ numbers.

ALGORITHM:

Step1: Start the program.
Step2: Declare int i, n, odd=0 and even=0;
Step3: Get the n value
Step4: for(i=0;i<=n;i++) do the following step.
  a) Check if(i%2==0)
  b) even=even+i;
  c) Else odd=odd+i;
Step5: Print the odd and even value.
Step6: Stop the program.

PROGRAM:

```
#include<stdio.h>
#include<conio.h>
void main()
{
int i,n,sum,even=0,odd=0;
clrscr();
printf("Enter any number: ");
scanf("%d",&n);
for(i=1;i<=n;i++)
{
if(i%2==0)
even=even+i;
else
odd=odd+i;
}
printf("Sum of even integer is: %d",even);
printf("Sum of odd integer is: %d",odd);
getch();
}
```

OUTPUT:

```
Enter any value: 5
Sum of even integer is: 6
Sum of odd integer is: 9
```

RESULT:

Thus the C program for finding the sum of even integers and odd integers of ‘N’ numbers has been successfully executed and verified.

Ex. No. 10 **PRODUCT OF TWO MATRICES OF ANY ORDER**

AIM:

To write a program for finding the product of two matrices of any order.

ALGORITHM:

Step1: Start the program.
Step2: Declare int Matrix A[9][9] , MatrixB[9][9] , Matrixsproduct [9][9].
Step3: Declare int n , i , j , k, Row1 , Row2 , Column1 , Column2.
Step4: Enter the order of Matrix A Row1, Column1.
Step4: Enter the order of Matrix B Row2, Column2.
Step5: Check if(Column1 == Row2)
Step6: Enter the elements of Matrix A and B using for loops.
Step7: Find Matrixproduct[i][j] = Matrixproduct[i][j] +(Matrix A[i][k] * Matrix B[k][j] using for loops.
Step7: Print the resultant matrix Matrixproduct[i][j] using for loop.
Step8: Else print invalid order so multiplication not possible.
Step9: Stop the program.

PROGRAM:

```
#include<stdio.h>
#include<conio.h>
void main()
{
  int Matrix A[9][9] , MatrixB[9][9] , Matrixsproduct [9][9] ;
  int n , i , j , k; /* 'i' used for rows and 'j' used for columns */ int Row1 , Row2 ,
  Column1 , Column2; clrscr();

  printf(" Enter the order of Matrix A\n");
  scanf("%d * %d " , &Row1 , &Column1);
  printf(" Enter the order of Matrix B\n");
  scanf("%d * %d " , &Row2 , &Column2);
  if(Column1 == Row2)
   {
    printf(" Enter the elements of Matrix A\n");
    for(i=0 ; i<Row1 ; i++)
    {
      for(j=0 ; j<Column1 ; j++)
      {
       scanf("%d" , &Matrix A[i][j] );
      }
    }
    printf(" Enter the elements of Matrix B\n");
```

```
    for(i=0 ; i<Row2 ; i++)
     {
       for(j=0 ; j<Column2 ; j++)
       {
         scanf("%d" , &Matrix B[i][j] );
       }
     }
    for(i=0 ; i<Row1 ; i++)
     {
       for(j=0 ; j<Column2 ; j++)
       {
         Matrixproduct[i][j] = 0 ;
         for(k=0 ; k<Row2 ; k++)
          {
          Matrixproduct[i][j] = Matrixproduct[i][j] +(Matrix A[i][k] * Matrix B[k][j] );
          }
       }
     }
    printf(" Product Matrix\n");
     for(i=0 ; i< Row1 ; i++)
     {
       for(j=0 ;j< Column2;j++)
       {
         printf("%d" , Matrixproduct[i][j] );
        }
       printf("\n");
     }
  }
  else
    printf(" Invalid order so Multiplication not possible\n");
}
```

OUTPUT:

```
Enter the order of Matrix A
2 * 2
Enter the order of MatrixB
2 * 2
Enter the elements of Matrix A
1
2
3
4
Enter the elements of Matrix B
5
6
7
8
Product Matrix
19      22
43      50
```

RESULT:

Thus the C program for finding the product of two matrices of any order has been successfully executed and verified.

Ex. No. 11 **READ 'N' NUMBER OF STUDENTS WITH 5 SUBJECT MARKS**

AIM:

To write a program for reading 'N' number of students with 5 subject marks.

ALGORITHM:

Step1: Start the program.
Step2: Initialize a character array n and integer array r and s.
Step3: Initialize integer i, j and n.
Step3: Read the value of n.
Step4: for(i=0;i<n;i++)

a) Enter rollno,name,,,,,,
b) Read these and enter 5 subject marks using for loop and array.

Step5: Display n[i],r[i],s[i][j]
Step6: Stop the program.

PROGRAM:

```
#include<stdio.h>
#include<conio.h>
void main()
{
        char n[20][10];
        int i,j,r[20],s[20][6];
        printf("Enter n value: ");
        scanf("%d",&n);
        for(i=0;i<n;i++)
        {
                printf("Enter name,rollno,....");
                scanf("%s%d",&n[i],&r[i]);
                printf("Enter 5 subject marks:");
                s[i][5]=0;
                for(j=0;j<5;j++)
                {
                        scanf("%d",s[i][j]);
                        s[i][5]=s[i][5]+s[i][j];
                }
        }
        printf("The data entered is: \n");
        for(i=0;i<n;i++)
        {
                printf("%s\t%d\t",n[i],r[i]);
                for(j=0;j<5;j++)
                        printf("%d\t",s[i][j]);
        }
getch();
}
```

OUTPUT:

```
Enter n value: 1
Enter name,rollno,….Eswar 20
Enter 5 subject marks:
10 50 34 06 42
The data entered is:
Eswar 20        10      50      34      06      42
```

RESULT:

Thus the C program for reading ‘N’ number of students with 5 subject marks has been successfully executed and verified.

Ex. No. 12 **GREATEST OF 'N' NUMBERS USING FUNCTION**

AIM: To write a program for finding greatest of 'n' numbers using function.

ALGORITHM:

Step1: Start the program.
Step2: Initialize integer a, b and c.
Step3: Read the value of a,b and c.
Step4: Call the function large().
   a) Check if((a>b) && (a>c)) then print a is greater.
   b) Check elseif (b>c) then print b is greater.
   c) Check else print c is greater.
Step5: Stop the program.

PROGRAM:

```
#include<stdio.h>
#include<conio.h>
void main()
{
        int a,b,c;
        printf(" Enter the value of a,b and c: ");
        scanf("%d, %d, %d", &a, &b, &c);
        large(a,b,c);
        getch();
}

large(int a, int b, int c)
{
  if((a>b) && (a>c))
        print("%d is greater than %d, %d", a, b, c);
  elseif (b>c)
        print("%d is greater than %d, %d", b, a, c);
else
        print("%d is greater than %d, %d", c, a, b);
}
```

OUTPUT:

```
Enter the value of a,b and c: 10 30 20
30 is greater than 10, 20
```

RESULT:

Thus the C program for finding greatest of 'n' numbers using function has been successfully executed and verified.

Ex. No. 13 **FIBONACCI SERIES USING RECURSION**

AIM:

To write a program for finding Fibonacci series using recursion.

ALGORITHM:

Step1: Start the program.
Step2: Initialize a function as int Fibonacci(int).
Step3: Initialize integer i=0, c and n in main function.
Step3: Read the value of n.
Step4: Within for loop call the Fibonacci(int) recursively.
Step5: In Fibonacci(int) function calculate (Fibonacci(n-1) + Fibonacci(n-2)) recursively and return the value.
Step6: Print the result.
Step7: Stop the program.

PROGRAM:

```
#include<stdio.h>
 int Fibonacci(int);
 int main()
        {
                int n, i = 0, c;
                printf("Enter the n value: ");
                scanf("%d",&n);
                printf("Fibonacci series\n");
                for ( c = 1 ; c <= n ; c++ )
                {
                        printf("%d\n", Fibonacci(i));
                        i++;
                }
                return 0;
        }
 int Fibonacci(int n)
{
  if ( n == 0 )
     return 0;
  else if ( n == 1 )
     return 1;
  else
     return ( Fibonacci(n-1) + Fibonacci(n-2) );
}
```

OUTPUT:

Enter the n value: 9

Fibonacci series: 0 1 1 2 3 5 8 13 21

RESULT:

Thus the C program for finding Fibonacci series using recursion has been successfully executed and verified.

Ex. No. 14 **LOWER CASE TO UPPERCASE CHARACTERS**

AIM: To write a program for converting all lower case to uppercase characters.

ALGORITHM:

Step1: Start the program.
Step2: Take a string a function of return value data type is void str upper.
Step3: Read a string.
Step4: While (s[i]! ='\0') the do the following
a)if((s[i]>='a') &&(s[i]<='z'))
b)s[i]=s[i]-32;
c)i++;
Step5: Display changed string.
Step6: Stop the program.

PROGRAM:

```
#include<stdio.h>
#include<conio.h>
void main()
{
        char str;
        printf("Enter a string: ");
        scanf("%s",str);
        to_str_upper(char[]);
        printf("Changed to: %s",str);
}
void to_str_upper(char[])
{
        int i=0;
        while(s[i]!='\0')
        {
                if((s[i]>='a') && (s[i]>='z'))
                s[i]=s[i]-32;
                i++;
        }
}
```

OUTPUT:

```
Enter a string : gnec
changed to: GNEC
```

RESULT:

Thus the C program for converting all lower case to uppercase characters has been successfully executed and verified.

Ex. No. 15 **SORT 5 CITY NAMES IN ALPHABETICAL ORDER**

AIM:

To write a program for sorting 5 city names in alphabetical order.

ALGORITHM:

Step1: Start the program.
Step2: Using for loop and array get the city name.
Step3: Using loop for(i=65;i<122;i++) and for(j=0;j<5;j++)
  a) Check if(city[j][0]==i)
  b) Display the sorted list of cities.
Step4: Stop the program.

PROGRAM:

```
#include<stdio.h>
#include<conio.h>
void main()
{
        ch city[5][20];
        int i,j;
        clrscr();
        printf("Enter the names of cities...\n\n");
        for(i=0;i<5;i++)
                scanf("%s",&city[i]);
        printf("Sorted list of cities...\n\n");
        for(i=65;i<122;i++)
        {
                for(j=0;j<5;j++)
                {
                        if(city[j][0]==i)
                        printf("\n%s",city[j]);
                }
        }}
```

OUTPUT:

Enter the names of cities: Hyderabad Chennai Bombay Goa Vizag
Sorted list of cities:
Bombay
Chennai
Goa
Hyderabad
Vizag

RESULT: Thus the C program for sorting 5 city names in alphabetical order has been successfully executed and verified.

Ex. No. 16 **EXTRACTS THE PART OF A STRING**

AIM:

To write a program for extracting the part of a string.

ALGORITHM:

Step1: Start the program.
Step2: Declare the character array s[30] and r[30].
Step3: Declare the integer variables i, j, m & n.
Step4: Get the input string using gets().
Step5: Get the value of m and n for extracing from the input string.
Step6: Initialize j=0.
Step7: Using a loop for(i=n-1;i<m+n-1;i++)
 a) Assign r[j]=s[i];
 b) Increment J by 1.
Step8: Print the extracted part of the string.
Step9: Stop the program.

PROGRAM:

```
#include<stdio.h>
#include<string.h>
void main()
{
  char s[30],r[30];
  int i,j,m,n;
  clrscr();
  printf("Enter a string: ");
  gets(s);
  printf("Enter the values of m & n: ");
  scanf("%d%d",&m,&n);
  j=0;
  for(i=n-1;i<m+n-1;i++)
   {
    r[j]=s[i];
    j++;
   }
  printf("The extracted part of string %s: ",r);
  getch();
}
```

OUTPUT:

Enter a string: Gurunanak
Enter the values of m & n: 3 5
The extracted part of string: run

RESULT:

Thus the C program for extracting a part from the given string was executed and verified.

Ex. No. 17 **CALL BY VALUE**

AIM:

To write a program to increment the value of an argument using call by value.

ALGORITHM:

Step1: Start the program.
Step2: Declare the integer variable x and a integer function incr()
Step3: Initialize x=7.
Step4: Pass the x value to the function incr(x).
a) Within the function increment the x value by 1.
b) Return the value.
Step5: Print the original value and incremented value of x.
Step6: Stop the program.

PROGRAM:

```
#include<stdio.h>
#include<string.h>
main()
  {   int x;
      int incr(int n);
      printf("***Call by Value***\n");
      x = 7;
      printf("Original value of x is: %d/n: ", x);
      printf("Value of incr(x) is: %d/n ", incr(x));
      printf("The value of x is: %d/n: ", x);
  }

  /* Function increments n */
  int incr(int n)
  {
      n = n + 1;
      return n;
  }
```

OUTPUT:

Original value of x is: 7
Value of incr(x) is : 8
The value of x is: 7

RESULT:

Thus the C program to increment the value of an argument using call by value was executed and verified.

Ex. No. 18 **CALL BY REFERENCE**

AIM:

To write a program for swapping two values using call by reference method.

ALGORITHM:

Step1: Start the program.
Step2: Assign the integer variable a=10 and b=20.
Step3: Call the swap() function.
Step4: Swap the values using pointer.
Step5: Print the original value and swapped value of a & b.
Step6: Stop the program.

PROGRAM:

```
#include<stdio.h>
#include<conio.h>
void swap( int *x, int *y )
{
   int t ;
   t = *x ;
   *x = *y ;
   *y = t ;
   printf( "\nx = %d y = %d", *x,*y);
}

int main( )
{
   int a = 10, b = 20 ;
   swap ( &a, &b ) ;
   printf ( "\na = %d b = %d", a, b ) ;
   getch();
}
```

OUTPUT:

a=10 b=20
x=20 y=10

RESULT:

Thus the C program to swap two values using call by reference method was executed and verified.

Ex. No. 19(a) **STRUCTURE**

AIM:

To write a program for displaying student information by initializing structures.

ALGORITHM:

Step1: Start the program.
Step2: Initialize a structure student with name as character array and roll number and age as integer.
Step3: In the main program crate a object s1 for the structure student.
Step4: Using the object s1 print the student name, roll number and age.
Step6: Stop the program.

PROGRAM:

```
#include<stdio.h>
struct student
{
        char name[10];
        int rollno;
        int age;
};
main()
{
        static struct student s1;
        clrscr();
        printf("Enter the name, rollno & age");
        scanf("%s%d%d\n",&s1.name,&s1.rollno,&s1.age);
        printf("%s %d %d",s1.name,s1.rollno,s1.age); getch();
}
```

OUTPUT:

```
Enter name, rollno & age
Ravi 11 25
Ravi 11 25
```

RESULT:

Thus the C program to display student information by initializing structures was executed and verified.

Ex. No. 19(b) **UNION**

AIM:

To write a program for implementing the concept of union data type.

ALGORITHM:

Step1: Start the program.
Step2: Initialize a union Data with Str as character array, i as integer and f as float.
Step3: In the main program crate a variable name data for the union Data.
Step4: Using the variable and member access operator print all the members of the union Data.
Step5: Stop the program.

PROGRAM:

```
#include <stdio.h>
#include <string.h>
 union Data
{
   int i;
   float f;
   char str[20];
};

int main( )
{
   union Data data;
   data.i = 10;
   printf( "data.i : %d\n", data.i);
   data.f = 220.5;
   printf( "data.f : %f\n", data.f);
   strcpy( data.str, "C Programming");
   printf( "data.str : %s\n", data.str);
   return 0;
}
```

OUTPUT:

```
data.i : 10
data.f : 220.500000
data.str : C Programming
```

RESULT:

Thus the C program to implement the concept of union data type was executed and verified.

Ex. No. 20 **ACCESS THE VALUE OF VARIABLES USING POINTER**

AIM:

To write a program for accessing the value of variables using pointer.

ALGORITHM:

Step1: Start the program.
Step2: Declare integer as a, b, c and two pointer variables *p1 & *p2.
Step3: Intialize a=12 and b=4.
Step4: Assign the a & b values to the pointer variables p1 & p2.
Step5: Perform arithematic operations.
Step6: Print the adderss of a & b and print the a, b, c, x & y values.
Step7: Stop the program.

PROGRAM:

```
#include<stdio.h>
main()
{
 int a,b,*p1,*p2,x,y,z;
 clrscr();
 a=12,b=4;
 p1=&a; p2=&b;
 x=*p1**p2-6;
 y=(4-*p2)**p1+10;
 printf("Address of a=%d\n",p1);
 printf("Address of b=%d\n",p2);
 printf("a=%d,b=%d\n",a,b);
 printf("x=%d,y=%d\n",x,y);
 *p2=*p2+3; *p1=*p2-5;
 z=*p1**p2-6;
 printf("a=%d,b=%d\n",a,b);
 printf("z=%d\n",z);
 getch();
}
```

OUTPUT: Address of a = 65543

Address of b = 64455
a = 12 b = 4
x = y =
z=42

RESULT:
Thus the C program to access the value of variables using pointer was executed and verified.

Ex. No. 21 **PRINT THE ELEMENT OF ARRAY USING POINTERS**

AIM:

To write a program for printing the element of array using pointers.

ALGORITHM:

Step1: Start the program.
Step2: Declare integer array a[5] and a pointer variable *p=&[0]
Step3: Intialize i as integer.
Step4: Using the for loop for(i=0;i<5;i++)
Step5: prtint the value of *(p+i).
Step6: Then using the for loop for(i=0;i<5;i++)
Stop7: Print the value of (p+1).
Step7: Stop the program.

PROGRAM:

```
#include<stdio.h>
main()
{
  int a[5]={5,4,6,8,9};
  int *p=&a[0];
  int i;
  clrscr();
  for(i=0;i<5;i++)
     printf("%d",*(p+i));
  for(i=0;i<5;i++)
     printf(" %u\n",(p+i));
  getch();
}
```

OUTPUT:

1 2 3 4 5

1 2 3 4 5

RESULT:

Thus the C program to print the element of array using pointers was executed and verified.

Ex. No. 22 **PRINT THE ELEMENTS OF A STRUCTURE USING POINTERS**

AIM:

To write a program printing the elements of a structure using pointers.

ALGORITHM:

Step1: Start the program.
step2: Take a character array name, a number and price in structure
step3: In main take a struct variable product and a pointer
Step4: Using a loop for(*ptr=product;ptr<product+3;ptr++)
Step5: Read the value by using array operator
ptr->name,ptr->no,ptr->price
step6: Display name,no,price.
Step7: Stop the program.

PROGRAM:

```
#include<stdio.h>
struct invest
{
    char name[20];
    int number;
    float price;
};
main()
{
   struct invest product[3],*ptr;
   clrscr();
   printf("input\n\n");
   for(*ptr=product[3];ptr<product+3;ptr++)
      scanf("%s%d%f",&ptr->name,&ptr->number,&ptr->price);
   printf("\nResult: \n\n");
   ptr=product;
   while(ptr<product+3)
    {
       printf("%20s%5d%10.2f\n",ptr->name,ptr->number,ptr->price);
       ptr++;
    }
   getch();
}
```

OUTPUT:

Raja

11

120

Result:

Raja

11

120

RESULT:

Thus the C program to print the elements of a structure using pointers was executed and verified.

Ex. No. 23 DISPLAY COLLEGE ADDRESS USING STRUCTURES AND POINTERS AIM:

To write a program for displaying college address using structures and pointers.

ALGORITHM:

Step1: Start the program.
Step2: Take name, location and city inside the collegeaddress structure.
Step3: Enter the required data.
Step4: Print the result.
Step5: Stop the program.

PROGRAM:

```
#include<stdio.h>
struct collegeaddress
{
        char name[20],location[20],city[20];
};
main()
{
        struct collegeaddress add,*ptr;
        p=&add;
        p->name={"Annamalai University"};
        p->location={"Annamalainagar"};
        p->city={"Chidambaram"};
        printf("%s%s%s",p->name,p->location,p->city);
}
```

OUTPUT:

Annamalai University Annamalainagar Chidambaram

RESULT:

Thus the C program to display college address using structures and pointers was executed and verified.

Ex. No. 24 **PASS STRUCTURE AS ARGUMENT TO FUNCTION**

AIM:

To write a program for passing structure as argument to function and calculate total marks of 5 subjects.

ALGORITHM:

Step1: Start the program.
Step2: Inside the structure ex2 declare 6 integers.
Step3: Declare structure ex2 as s1.
Step4: Declare structure ex2 as s2,ex2 as fun().
Step5: Display the message as enter the marks.
Step6: Take value of the subjects from the user.
Step7: Store the return value in s2.total.
Step8: Print the value of s2.total.
Step9: Stop the program.

PROGRAM:

```
#include<stdio.h>
struct ex2
{
  int m1,m2,m3,m4,m5,total;
};
main()
{
  struct ex2 s1;
  struct ex2 s2;
  struct ex2 fun();
  printf("enter the marks");
  scanf("%d%d%d%d%d",&s1.m1,&s1.m2,&s1.m3,&s1.m4,&s1.m5);
  s2=fun(s3);
  printf("%d",s1.total);
}
struct ex2 fun(s3)
struct ex2 s3;
{
  s3.total=s3.m1+s3.m2+s3.m3+s3.m4+s3.m5;
  return(s3);
}
```

OUTPUT:

Enter the marks
10 20 30 40 50
150

RESULT:

Thus the C program to pass structure as argument to function and calculate total marks of 5 subjects was executed and verified.

Ex. No. 25 **WRITE INTEGER DATA INTO FILE AND READ IT FROM FILE**

AIM:

To write a program for writing integer data into file and read it from file.

ALGORITHM:

Step1: Start the program.
Step2: Initialize integer num.
Step3: Declare FILE *f2.
Step4: Open the file f2 using fopen() in write mode.
Step5: Get the integer from user and write it into the file using putw().
Step6: Close the file.
Step7: Open the file f2 using fopen() in read mode.
Step8: Read the integer using getw().
Step9: Print the integer.
Stop10: Close the file.
Step11: Stop the program.

PROGRAM:

```
#include<stdio.h>
main()
{
  int num;
  FILE *f2;
  f2=fopen("data.int","w");
  scanf("%d",&num);
  putw(num,f2);
  fclose(f2);
  f2=fopen("data.int","r");
  num=getw(f2);
  printf("%d",num);
  fclose(f2);
}
```

OUTPUT:

```
12
12
```

RESULT:

Thus the C program to write integer data into file and read it from file was executed and verified.

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR
Lab Manual

Title of Course: Language Lab-I
Course Code: HU181
L-T-P scheme: 0-0-2 **Course Credit: 2**

Objectives:
1. This Course has been designed to impart advanced skills of Technical Communication in English through Language Lab. Practice Sessions to 1ST Semester UG students of Engineering &Technology.
2. To enable them to communicate confidently and competently in English Language in all spheres.

Learning Outcomes:
1. This course will help the students to learn English very easily. Even the Hindi medium students can translates easily.
2. The technical communication will help the students to improve their speaking skills and drafting skill for engineering students.

Course Contents:
Exercises that must be done in this course are listed below:
Exercise No.1: Phonetic symbols and transcription.
Exercise No. 2: Honing 'Listening Skill' and its sub skills through Language Lab Audio device;
Exercise No. 3: Honing 'Speaking Skill' and its sub skills;
Exercise No. 4: Master Linguistic/Paralinguistic features (Pronunciation/Phonetics/Voice modulation/Stress/ Intonation/ Pitch Accent) of connected speech;
Exercise No. 5: Honing 'Conversation Skill' using Language Lab Audio –Visual input; Conversational Practice Sessions (Face to Face/ via Telephone, Mobile phone & Role Play Mode);
Exercise No. 6: Introducing 'Group Discussion' through audio –Visual input and acquainting them with key strategies for success;
Exercise No. 7: G D Practice Sessions for helping them internalize basic Principles (turn-taking, creative intervention, by using correct body language, courtesies & other soft skills) of GD;
Exercise No. 8: Honing 'Reading Skills' and its sub skills using Visual/ Graphics/Diagrams /Chart Display/Technical/Non Technical Passages; Learning Global/ Contextual/ Inferential Comprehension;
Exercise No. 9: Honing 'Writing Skill' and its sub skills by using Language Lab Audio –Visual input;
Practice Sessions
Exercise No. 10: Group discussion

Text Book:

1. Phonetic Symbol Guide Book by Geoffrey K. Pullum.
2. Dr.D.Sudharani: Manual for English Language Laboratory Pearson Education (WB edition),2010
3. Board of Editors: Contemporary Communicative English for Technical Communication Pearson Longman, 2010